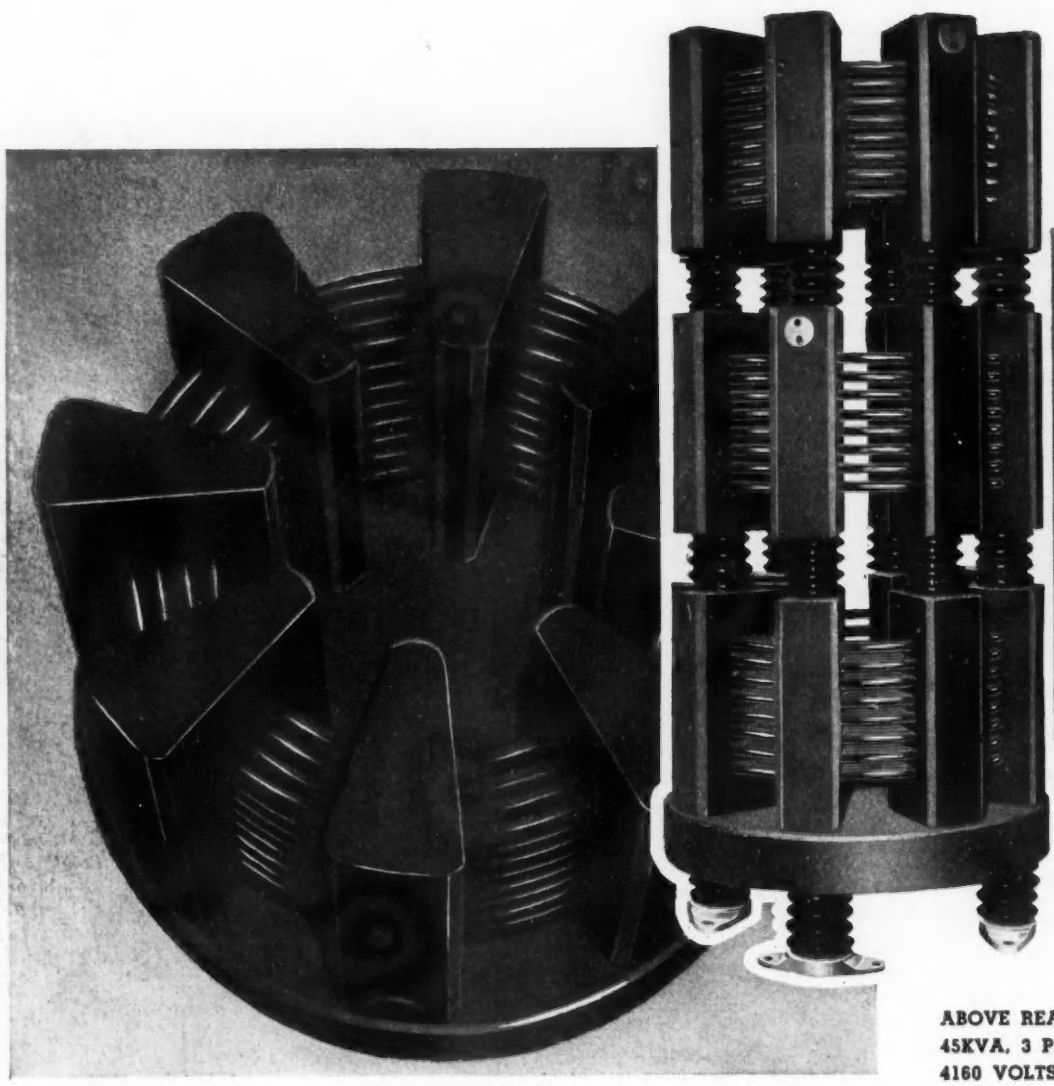
ELECTRICAL WORLD

A McGRAW-HILL PUBLICATION

JULY 31, 1948

The Toledo Story Of Planned Lighting Sales

CURRENT LIMITING REACTORS FOR MODERN ELECTRICAL DISTRIBUTION ► SIMPLE IN DESIGN ► ADEQUATE OVERLOAD CAPACITY ► HIGH INSULATION STRENGTH ► LOW LOSSES ► FOR INDOOR OR OUTDOOR APPLICATIONS ► VERTICAL OR HORIZONTAL MOUNTING ► DESIGNED TO SUIT ANY REQUIREMENTS. OUR ENGINEERS WELCOME CONSULTATION.



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ELECTRICAL WORLD

Published for 74 years for those engaged in the business of generating, transmitting, distributing or applying electric power

July 31, 1948

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COMING IN THE AUGUST 14 ISSUE
One Less River To Boss
A Report On Wisconsin River Development

ONLY TIME-TESTED INSULATION STABILITY ASSURES *LONG LIFE* IN VARNISHED CAMBRIC CABLE

Varnished Cambric switchboard wire (flameproof braid)
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Three conductor V. C. Cable with lead sheath

...and long time heat runs *PROVE* stability of Okonite V. C. cables

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Okonite varnished cambric cables permit high operating temperatures, allowing heavy current loading . . . are easy to splice and handle . . . are available in all sizes and for use up to 28,000 volts. For a detailed description of Okonite's entire varnished cambric line with illustrations, tables and current carrying capacities, write for a copy of Bulletin EW-1013. Address The Okonite Company, Passaic, New Jersey.

With today's installation costs* only the *Longest-Lived* will be economical

*The lifetime cost of a cable rather than its first cost is the only true measure. Okonite wires and cables, made to stand up better and last longer, can offset high installation costs.

6848

OKONITE insulated wires and cables

THE BEST CABLE IS YOUR BEST POLICY

JULY 31, 1948

If You Haven't Begun You'd Better Begin

ELECTRIC UTILITIES should accelerate lighting sales effort—now. This high-return, low-cost business is a must in this and next year's selling program and if you haven't begun you'd better begin.

Peak load, crowding uncomfortably close to the ceiling of capacity is not a good reason for holding back. Lighting sales activity, started now, will not cause capacity embarrassment in 1948. A year or more will pass before results will be felt. By then, the capacity situation should be eased and the effect of present-day high cost investment will be more acutely felt.

There are other good reasons for going ahead on lighting sales promotion at this time.

This business may be a good load factor builder. Lighting-load is more predominant in the evening after the industrial load begins to drop. It would, therefore, improve average daily load factor for those companies having their daytime peak produced by industrial load or air conditioning.

The benefit of a large increase in revenue may outweigh the hazard of increased peak load even if promotion brings quick results.

The utilities may have already missed a grand opportunity to garner a sizeable increase in revenue at small cost in money and effort. That was in 1947. Through that year prices climbed steeply. Merchants had more money in their cash registers than they had ever seen there before. They were feeling flush and their resistance to suggestions for improvement of lighting in their stores was low. Now, like everyone else whose money intake rose sharply, they have had time to recognize the grim fact that more dollars are not the same as more buying power. They are discovering that modern lighting has a price tag on it, a thing they might easily have overlooked a year ago.

In 1947, a great wave of industrial plant expansion and improvement came to a crest. In its rise, it opened up great opportunities for lighting sales. They are disappearing as the wave subsides.

It was a cinch to sell commercial and industrial lighting in 1947. It is not so easy now. It will get harder as time goes on. That is why we say that no electric utility can start selling lighting too soon.

You want proof of this argument? Then read and ponder over the "Toledo Story" in this issue of ELECTRICAL WORLD. Note the commercial revenue increase of $430,000 as against a sales cost of $65,000 and the slowing up of the pace of lighting sales after 1947.

Note also that Toledo Edison is increasing its effort in lighting sales. This is because the company believes there is still a lot of revenue to be garnered in the lighting market. It won't come in at the rate of $7 of revenue for every dollar of sales cost, but it will still be low-cost revenue for some time to come. And it will be a mighty welcome contributor to net when the necessity to earn adequate return on higher unit investment ceases to be a worry for tomorrow and becomes a heavy, sharp-cornered difficulty of today.

On the basis of all this, we feel safe in reiterating—if you haven't begun, you'd better begin.

A Reassuring Decision

NOT A GREAT DEAL of attention was paid to it, but the Atomic Energy Commission made a decision recently which we think is of considerable importance. That was the decision which permits Dr Edward U Condon to continue the work he has done in connection with this country's atomic energy program. Condon, it will be recalled, had been under serious attack by the House Un-American Activities committee as "the weakest link in our atomic security chain."

Even more intriguing than the personal vindication of Condon, welcome as that is, is a spirit evidenced by the following paragraph from AEC's statement on the case:

"The five members of AEC have examined . . . the entire record. Although its Personnel Security Review Board expressed the opinion . . . that action by the Commission . . . might . . . be deferred, pending reasonably prompt action by the House Committee . . . the Commission considers that . . . this is a case which the members of the Commission should themselves decide, and that it is our duty to proceed at this time to such a decision."

AEC, then, decided against further excusable delay in settling the Condon case. It did so with full knowledge of the political ramifications its action might have, particularly in so political a period.

ELECTRICAL WORLD suspects that the Condon decision by AEC will be a heartening one to many people in the electrical industry. It certainly should hearten any professional association which is concerned about the academic and professional freedom which is open to its members. It certainly should hearten the scientists and the technologists who work for electrical manufacturers. Somewhat more far-fetched, perhaps, but not unrealistic, is the feeling that the Condon decision should hearten the electric power industry. Some day, the power business will be extremely interested in a number of decisions AEC will have to make about atomic power. There's nothing in the Condon case which indicates that AEC's decisions on power will be the ones the power business wants to hear. But it looks, at least, as if there will be courageous decisions, which is more than can be had from some federal functionaries.

Who's In Charge Here?

FROM GENEVA comes word that the British government has refused flatly to give a United Nations group any data on its ability to manufacture heavy power equipment or on its plans for exporting the same. The rest of the story is a little obscure, but it appears that Britain, in its frantic scramble for dollars, wants to peddle its power equipment when and where—and for what currency—it chooses.

From Britain's immediate standpoint, that's fair enough. There's a booming market for such equipment and Britain is the world's second-largest supplier of it. For a country that's scrambling for dollars, what could be nicer?

But for a country that has the largest stake of all in the Marshall Plan, this position raises some questions. Isn't the Marshall Plan one of "mutual self-help," with the deficit made up by the United States? Didn't the Paris Report say Europe would furnish 22,500,000 of the 25,000,000 kw which are needed? And isn't the British electrical manufacturing industry the sine qua non of any program whereunder Europe would supply itself with 22,500,000 kw of power capacity—in place and operating?

We've seen how the British loan, which was intended for capital goods, was expended in large part upon anything but that. Are we about to see a second case wherein help extended for one purpose actually buys something else? No one wants to believe that the British are second-guessing the Marshall Plan. But everyone will want to make certain about it.

ELECTRICAL WORLD predicted, almost a year ago, that the Marshall Plan nations would not be able to produce and install the 22,500,000 kw of new generating plant which the cooperating countries said they could put up in four years. We have seen no reason in the past nine months to change this belief. Indeed, we've seen many experts, in and out of government, come up with the same conclusion we did.

Now any attempt by the Marshall Plan countries to make and install 22,500,000 kw in four years would stand or fall on the British participation. If Britain's exportable production of power equipment went to nations other than those participating in the Marshall Plan, those countries would fall much farther short of 22,500,000 kw in four years than they will as it is.

On the basis of all this, ELECTRICAL WORLD feels a lot happier to have men like Walker Cisler and Cornelius DeForest heading the ECA power programs. They are capable men with a grasp of power supply realities and the mechanisms for keeping abreast of things. They should be invaluable in helping operate the Marshall Plan's power program in the best interests of everyone.

Gaging Regulatory Sentiments

MANY RECENT DISCUSSIONS of rate trends in the power business have contained arguments indicating that regulatory agencies are not insensible to utility problems. This has been borne out by commissions in Detroit, Washington, D. C., Georgia and Ohio. It's all mighty reassuring to an industry which certainly is aware of the rate squeeze, however reluctant it is to raise rates, particularly non-industrial rates.

It is possible that any month now, we'll have another specific indicator as to the accuracy of the presumption that the commissions know the score. FPC has just suspended a second adjustment in wholesale rate schedules. Its decisions on them, and the time required to get the decisions, may foreshadow the attitude of FPC and its satellites among the states.

NEWS OF THE ELECTRICAL WORLD

The Electrical Week

Public power was given only a minor place on President Truman's program of "must" legislation for Congress . . . The Reclamation Bureau has $250,000,000 to spend on construction. Only 263,000 kw will be added in fiscal 1949, but the Bureau will continue with other plants and transmission lines . . . Army Engineers have put their okay on the St. Lawrence project and sent it to FPC . . . AEC released its most optimistic report to date on the use of atomic fuel for power plants. However, it added two conditions that must be met . . . Hydroelectric power, particularly as it relates to the Columbia basin, dominated the ASCE meeting at Seattle . . . REA loans to co-ops for building and equipping offices has some economy-minded Congressmen wondering just where the loans should stop.

Truman's call for the return of Congress gave TVA two more chances to fight for its proposed steam generating plant at New Johnsonville, Tenn. If Congress again rejects the project, the issue will go to the 81st Congress next January in the federal budget prepared by the present administration. TVA proponents predict the opposition will diminish with every record vote taken.

More and more power sales executives anticipate a real competitive tussle between natural gas and electricity. They are less concerned over the disparity between gas and electric appliance prices than they are over the high costs of installing heavy-load electrical equipment.

Idea for New York-Province of Ontario development of power at the International Rapids of the St. Lawrence river did not originate in Albany. It first came up when New York Power Authority representatives were in Washington last winter to attend Senate hearings on proposed federal construction of the entire Seaway project.

If you want to enjoy boom times while your business slumps, try the electrical field. The Commerce Department reports that two of its branches were in this predicament in May. Retail sales of radio and household appliance stores slumped 4% but remained 11% above those of the comparable month a year earlier. Electrical wholesalers saw business drop 8% but remain 7% above May, 1947.

At least three more operating electric utilities are thinking of suspending promotion of home freezers unless sales increase this year. Promotion costs per unit sold have been reaching appalling levels.

The experts aren't happy over the way productivity continues to dawdle behind the rate of growth it showed year after year pre-war. Based on much less knowledge than they'd like to have on the subject, some experts concluded recently that non-manufacturing industries are responsible for the rise in productivity we have experienced since pre-war, (and it's less than half what it should be). Of the non-manufacturing industries, electric power, with a 36 percent rise in productivity per manhour, lead the procession.

Washington reportedly is agog at the prospect of an influx of the distaff side into important administrative jobs if Dewey becomes the next President. This looks like a return to the days of the real kitchen cabinet.

Despite repeated reassurances from Washington, there are increasing reports that Europe will count heavily on the U. S. for finished electric generating and transmission equipment, especially water wheels and other hydro facilities. Some observers feel that this expected demand, as well as the political situation, is behind frenzied efforts of federal power agencies to get more money and place equipment orders now.

The Bell System furnishes a striking example for those in the power business who hesitate to admit capacity shortages. AT&T has announced quite calmly that, even though the war ended almost three years ago and that 1,485,000 phones were installed during the first six months of 1948, it still has an unserved backlog of 1,340,000 customers.

Public Power Given Minor Place by President in 'Must' Legislation

PUBLIC POWER PROJECTS won a place on President Truman's program of "must legislation" for the revived session of Congress. But it was strictly a secondary—or lower—place.

In his message to the returning Congress this week (July 27), the President emphasized that he wanted first and foremost action on inflation control and housing measures. Other action then should be taken on eight other "important measures," he urged. At the end of this secondary list he placed additional appropriation of $56,000,000 for federal power projects and elimination of restrictions imposed during the recent session of Congress on power agencies.

The President told Congress it should reconsider the limitations and appropriations because they "cut sharply into our national electric power policy."

"There is an acute shortage of electric power in this country now," he asserted. "I am therefore resubmitting to the Congress appropriation requests for certain power projects which must be provided right away."

"These requests include the TVA steam plant at New Johnsonville, Tenn., and certain other projects on which Congressional reductions, if allowed to stand, will delay the production of power for a year or more. These appropriations should be promptly enacted, and at the same time, certain crippling limitations should be removed."

Day after his message to Congress (Wednesday), the President sent a supplemental appropriation bill to Congressional appropriations committees. The bill carried out his recommendations, including language to eliminate legislative restrictions imposed in annual appropriation bills on several agencies.

Truman requested, again, $4,000,000 to start construction on TVA's much-debated steam plant project.

But the largest fund sought for any single agency was the $32,412,000 requested in the measure for projects of the Army Engineers. Original 1949 budget requests would be restored under the measure for 11 Army projects, all of them involving power installations. The projects and amounts asked for each follow:

McNary Dam	$8,000,000
Wolf Creek, Ken.	7,287,000
Bull Shoals, Ark.	3,000,000
Narrows Dam, Ark.	800,000
Whitney, Tex.	1,172,000
Foster Creek, Wash.	583,000
Garrison Dam, N. D.	4,400,000
Ft. Gibson, Okla.	2,000,000
Folsom Reservoir, Calif.	2,370,000
Blakely Mountain, Ark.	800,000
Jim Woodruff Dam, Fla.	2,000,000

Construction funds totaling $17,048,350 were requested for Bureau of Reclamation. Seven construction projects, like those of the Army, were covered with requests for restoration of the amounts recommended earlier this year in the federal budget. Projects and construction funds sought follow:

Davis Dam, Ariz.	$3,302,000
Central Valley, Calif.	3,990,000
Colorado-Big Thompson, Colo.	2,775,000
Hungry Horse, Mont.	2,183,350
Columbia Basin, Wash.	1,473,000
Fort Peck Power, Mont.	1,500,000
Missouri Basin	1,825,000

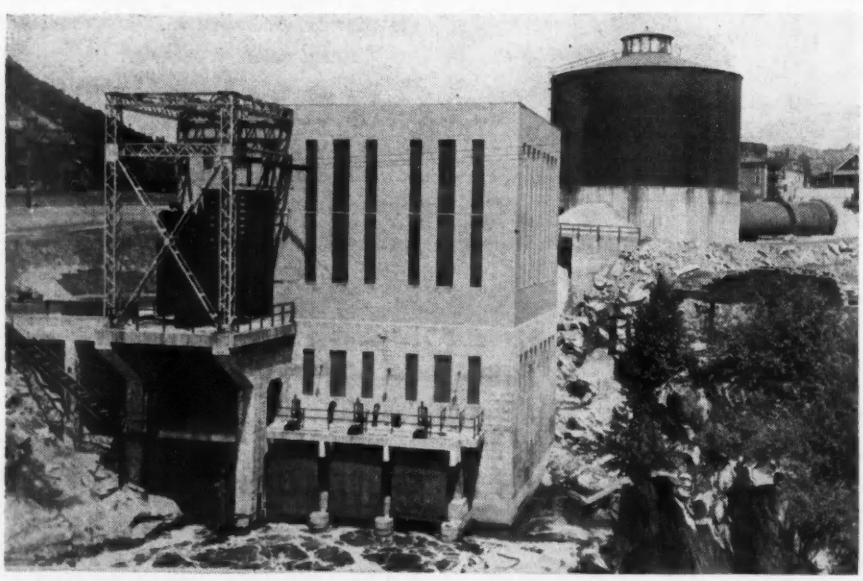
Principal construction items covered in the Central Valley request included restoration of funds for the Elverta Switchyards and for construction of transmission lines on the west side of the valley. On the Fort Peck project, the restoration of money for the Harve-Shelby transmission line was specifically requested.

In addition, the bill contained a total of $209,100 slashed out of the Bureau's budget for operation and maintenance costs. The restored funds would be applied in Central Valley, $45,600; in the Columbia Basin, $135,000, and at the Shoshone project, Wyoming, $28,500. The funds are needed for new generating units which will be installed during the current fiscal year on those projects, it was stated.

Three restrictions placed on Reclamation Bureau activities in the last Appropriation Bill also would be removed by language in the supplemental measure. These are the limitation of $7,800,000 for expenditures during the fiscal year by the Bureau's engineering office in Denver, the ceiling of 48,000 persons established for total Bureau personnel, and limitation of force account work to 8% of all construction operations.

Bonneville Power Administration was slated for no new funds, but it was requested that the 8% force account work limitation also be lifted for BPA's activities.

Southwestern Power Administration came in for the $3,055,000 which it requested in its annual budget for transmission line and substation construction. This sum, like all other funds requested, was eliminated from the budget by Congressional action.



J. BRODIE SMITH hydroelectric station of the Public Service Co of New Hampshire was dedicated July 14. The new plant on the Androscoggin River at Berlin has a capacity of 15,000 kw, a static head of 88.34 ft, a 2,000,000-gal. surge tank (shown at rear), and is the first unit generating station of the hydro type (generator, switchgear, and transformer). It has amplidyne excitation and an 8.5-ft. high bascule discharge gate

Contractor Gets Award

Gustav Hirsch Organization, Inc, Cleveland construction firm, has won $2,800 damages from the Chautauqua-Cattaraugus Electric Cooperative, Inc, Cherry Creek, N. Y. The award was made by Federal Judge John Knight at Buffalo. The contracting firm charged the co-op held up construction in 1944 by neglecting to obtain rights-of-way and furnish materials. The company had asked $60,331 damages.

DEATH STRUCK Dan E. Crick, a Nashville, Tenn., lineman as he was repairing damage following a storm. Crick was killed when a broken wire he was handling came in contact with a live 2,300-v line. Crick's body can be seen hanging from the top of the 40-ft pole as Foreman W. H. Barnett, on the ladder, cuts away electric lines

$250,000,000 Construction Placed on Reclamation Bureau Schedule

THE BUREAU OF RECLAMATION has completed scheduling of a $250,000,000 construction program for fiscal 1949. Of the total funds available from new and carry-over appropriations, the agency will spend some $174,000,000 on Western projects having major power facilities.

The Bureau will add only 263,000 kw to the capacity of its hydro generating plants during the fiscal year ending next June 30. But it will continue work on a number of new power plants and on transmission lines.

The year's work schedule was based on studies made at the Bureau's recent annual construction conference at Grand Lake, Colo. According to Commissioner Michael W. Straus, the conference also approved tentative work schedules for the next six years, subject to fund advances by the Congress. This long-range programming calls for irrigation of an additional 4,500,000 acres and installation of another 2,500,000 kw of hydro generating capacity by 1955, Straus said.

New generating units will be put into operation this year on the Shoshone project, Wyoming (5,000 kw); at Shasta Dam, Calif. (150,000 kw), and at Grand Coulee Dam, Wash. (108,000 kw). In addition, work on power installations will continue at the following projects:

Yakima, Wash.—Transmission lines to supply pumping power.

Anderson Ranch Dam, Idaho—Power plant and manufacture of turbines, generators and appurtenant facilities.

Hungry Horse Dam, Mont.—Construction of dam and power plant, manufacture of turbines and generators.

Central Valley, Calif.—Installation of last two generating units at Shasta, transmission lines to Shasta substation, work on East Side line from Shasta to Tracy, and switchyards at each terminal.

Davis Dam, Ariz.—Construction of dam and power plant, tunnel facilities at switchyard, and backbone transmission grid; completion of second 115-kv Phoenix-Tucson transmission line.

Hoover Dam, Nev.-Ariz.—Manufacture of two additional generating units to supply energy for Arizona; power plant improvements.

Parker Dam, Ariz.—Improvements of power plant and switchyards.

Rio Grande, Tex.-N. Mex.—Completion Elephant Butte-Socoro transmission line; procurement of equipment for Alamogordo, Hollywood and Socoro substations, and Elephant Butte switching facilities.

Canyon Ferry Dam, Mont.—Review of feasibility, as directed by Congress; construction of dam, if possible.

Shoshone, Wyo.—Work on power facilities at Heart Mountain, substantial completion of Heart Mountain power plant and switchyards, and Heart Mountain-Garland transmission line.

Fort Peck, Mont.—Construction of transmission facilities from Fort Peck to Williston and Glendive to Miles City; work on tap lines and substations to serve rural co-ops and irrigation units.

Colorado-Big Thompson, Colo.—Construction of Estes Park aqueduct and power system.

Kendrick, Wyo.—Completion of Medicine Bow-Hanna and Casper-Kortes-Seminoe transmission lines; start on Casper, Medicine Bow and Cheyenne Substations.

Kortes Dam, Wyo.—Construction of dam and power plant.

In addition, the following Missouri basin transmission lines will be completed during the fiscal year: Gering-Sidney, Sterling-Sidney, Gering-Alliance, Cheyenne-Sterling and Glendo-Lusk. Work will be started on the Fort Randall-O'Neill line, Sidney substation, Gering substation additions, Alliance substation, Pine Bluff substation, Casper substation, Lusk substation, Sterling substation and the Sterling-Ogallala section of the Sterling-North Platte line.

•

Voted Franchise Renewal

Iowa Public Service Co has been voted a 25-year renewal of its Arion franchise.

Army Engineers Okay St. Lawrence Project, FPC Next to Take Action

NEW YORK's bid to develop power at the International Rapids of the St. Lawrence River, in conjunction with the Canadian Province of Ontario, passed its first hurdle this week. The Army's Chief of Engineers gave the project a preliminary okay in a communication to the Federal Power Commission.

Though merely tentative, the Army's approval of the New York-Ontario plans clears the way for FPC action on the application for license to construct and operate power facilities on the U. S. side of the international boundary.

FPC has set Aug 26 as the final date for formal protests against the project. The Commission probably will schedule hearings for mid-September, providing the New York agency is prepared to present its case by that time.

FPC Approval Expected

Barring unforeseen complications, FPC may be expected to consider the application favorably. The Commission long has been on record as supporting development of power on the St. Lawrence. Last winter the agency, then composed of four of its present five members, reiterated this stand in comment on the ill-fated Vandenberg resolution proposing federal development of the St. Lawrence seaway and power project.

FPC approval of the license application would be tantamount to final U. S. acceptance of the development plans. The Commission will require NYPA to clear more detailed construction plans with the Army Engineers in order to avoid possible interference with present and future navigation facilities. But the Power Authority already has indicated it would follow closely plans formulated by the Engineers when they were studying the seaway project.

IJC Has Little Authority

When—and if—FPC and the Army clear the license, the project will go to the International Joint Commission, technically for final approval. Actually, however, IJC is empowered to do little in connection with such a proposal further than iron out any differences arising between Canada and the U. S. No differences are expected to be encountered, since the Hydro-Electric Power Commission of Ontario, which will build and operate the Canadian power facilities, will ask the Canadian Government for approval of development plans complementing those of the New York Authority.

The International Joint Commission undoubtedly will conduct its own hearings, probably in both countries. But the real fight on the proposal probably will come during the FPC hearings. Coal, railroad, and Atlantic seaport interests, the traditional foes of federal construction of the seaway project, probably will supply the fireworks.

Basically, these groups will oppose non-federal construction of the power facilities for the same reasons the Engineers favor them. If New York and Ontario build the power dam and plant, much of the cost of navigation improvements contemplated in the Army's seaway plans will be eliminated. Thus, it may be much easier to obtain Congressional approval for U. S.-Canadian development of the navigation features.

In addition, the New York-Ontario project would relieve the Engineers of a political hot potato. The Corps would have no concern as to how the power should be distributed, no responsibility for procuring or installing generating equipment, or any of the other knotty problems now destined for the New York Power Authority.

Actually, the Authority is expected to share the eventual power output with other states—probably Vermont and New Hampshire.

Privately owned utilities of the area are not likely to oppose the development. They need the power and probably will get much of it. The New York Authority is not contemplating construction of transmission lines, expecting to use utility lines to carry the new energy to its customers.

Utility people also like the Authority's proposal for financing its share of the project costs. The agency says it will issue no bonds for construction until it has completed power contracts which will net sufficient revenues to amortize the project within 50 years. Electric companies are in the best position to negotiate such contracts quickly.

Undoubtedly, however, the Authority will make some provision for getting part of the energy to municipally owned electric systems, REA co-ops, and public bodies. FPC may insist on it.

GROUNDBREAKING is becoming a habit with George A. Neal, left, president, and H. M. Smith, vice-president, Iowa Public Service Co. Here they are before breaking ground for a 7,500-kw plant near Storm Lake. Ten days later they did a similar job at Eagle Grove for a plant of the same size

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Electric Energy Sales in April Rose 9.8%

Sales of electric energy to ultimate customers in April 1948 totaled 19,400,000,000 kwhr, the Edison Electric Institute reports. This was a 9.8% increase over the 17,664,962,000 kwhr sold in April 1947.

Revenues from ultimate customers amounted to $346,644,500, compared with $310,762,400 in April 1947, an increase of 11.5%.

Classification of Sales, April

Kilowatthour Sales	Million Kwhr April 1948	Million Kwhr 1947	Percent Change
Residential or domestic	4,159	3,572	+16.4
Rural (Distinct rural rates)	463	421	+ 9.9
Commercial or industrial			
Small light and power	3,450	3,070	+12.4
Large light and power	10,014	9,264	+ 8.1
Street and highway lighting	188	178	+ 5.1
Other public authorities	509	494	+ 2.9
Railways and railroads			
Street and interurban	339	396	—14.4
Electrified steam railroads	221	222	— 0.4
Interdepartmental	57	46	+22.7
Total to ultimate customers	19,400	17,665	+ 9.8

For the 12 months ended April 30, the average use per customer advanced to 1,490 kwhr from 1,368 kwhr for the preceding year, an increase of 8.9%; the average annual bill to $45.30 from $43.23, an increase of 4.8%; revenue per kwhr dropped to 3.04 cents from 3.16 cents, a decrease of 3.8%.

•

Named Project Engineer

Col. F. L. Beadle, recently retired from the Corps of Engineers, has been appointed project engineer on the $1,400,000 transmission line which Pacific Power & Light Co is building in central Oregon. It will be his task to complete the line by a tentative Oct 1 deadline.

PORTABLE POWER PLANT is this tractor. It was used to operate the presses of a newspaper in Iola, Kan., when the municipal power was flooded out by the Neosho River

AEC Foresees Atoms Competing with Coal for Energy but Adds Ifs

ULTIMATE OUTPUT of atomic energy in this country may be as great or greater than present output of coal power "and will operate at a lower cost, at least as far as fuel expenditure is concerned."

That's the Atomic Energy Commission's latest view on power prospects, provided that favorable assumptions are made about two things:

1. That the cost of uranium does not rise markedly in the future because of forced resort to lower-grade ores; and

2. That the theoretical possibilities of "breeding" atomic fuel can be realized in engineering practice. This last means building atomic reactors which are highly efficient—so that when they consume fissionable materials they will at the same time produce an equal or greater amount of new fissionable material by transmutation of non-fissionable uranium or of thorium.

If unfavorable assumptions are made —that the cost of uranium will rise and that breeding will prove impracticable —then atomic power could compete with coal power only in regions where cost of transportation from the mine is a determining factor.

This view on economic prospects from atomic power is much the most optomistic which has ever come from official sources. It puts the official AEC position much more nearly in line with private estimates that the ultimate cost of atom power would drop somewhere between hydro and steam.

The new position appears in this week's semi-annual report of AEC. It is presented as a report to AEC of the Commission's General Advisory Committee. This source is particularly significant, since Advisory Committee has been generally considered as the group in the government most pessimistic on power possibilities.

As to time scale, the Advisory Committee is still rather conservative. It points out that two reactors to produce token electric power should be completed within the next two or three years.

One of these is the air-cooled natural-uranium pile at Brookhaven Laboratory, on Long Island, due for completion early next year. It will produce some power from the heat of its cooling air but not even enough to run the blowers which drive the cooling system.

The other is a recactor of advanced design at the Argonne Laboratory in Chicago. This will be a fast-neutron pile using enriched fuel and cooled by liquid metal. It will run at a high temperature and will produce power in something approaching commercial quantities, though hardly at commercial costs. Construction of this reactor, under discussion for the last year and a half, was finally given formal approval last month.

Building on experience with these two units and their successors, the Advisory Committee thinks, "fairly practical reactors that might be useful for special purposes" should be available within a decade.

In about 20 years, under favorable circumstances, a "considerable portion of the present power supply of the world" might be replaced by nuclear fuel, the committee thinks.

Most of the current AEC report is devoted to a very full account of work being done with radioactive isotopes—by the Commission and by outside investigators. AEC emphasized the profitable business opportunities to be expected in this field—in sale of instruments to researchers, in design and maintenance services for hot laboratories, and in the preparation of radiolabeled compounds. Two firms, Tracerlab, Boston, and Abbot Laboratories, Chicago, have already entered this field, two more are expected momentarily, and a fifth is dickering.

Firms getting into these lines of business, says AEC "are looking beyond today's market, in which 8 out of 10 isotope research projects are concerned with basic science, fewer than one out of ten with industrial problems. Of course the supplying of laboratories and hospitals can be a good-sized business in itself. But the potential application of isotopes to the work of industry—for the control of processes, the testing of products, and the development of entirely new products and processes—is an open field of opportunity."

•

Freight Rates Driving Utility Back to Missouri

The increase of railroad freight rates for hauling coal may have a great effect on one electric utility, Union Electric Co of Missouri. The Missouri utility has been producing most of its energy at plants of a subsidiary in Illinois where coal was cheaper than in Missouri.

Now Union has applied to SEC to take over the West Kentucky Coal Co from its parent, the North American Co. If SEC gives its consent, Union will proceed to build its new power plants in Missouri along the Mississippi. Coal will be brought in from Caseyville, Ken., by barge.

It is estimated that the present barge rate from Caseyville to St. Louis is $1 a ton. The freight rate is $2.33.

Hydroelectric Power Is Dominant Theme of ASCE Meeting at Seattle

HYDROELECTRIC POWER, particularly as it relates to the Columbia Basin Project, was the dominant theme at the convention of the American Society of Civil Engineers in Seattle, July 21-24.

Eugene L. Grant, professor of the economics of engineering at Stanford University, in the keynote address, advocated financing federal power projects by revenue bonds rather than by Congressional appropriation.

The present practice in financing such projects, with the necessity of arguing for every appropriation, will make a chronic condition of the present tight power situation, Grant predicted.

Current prosperous conditions discourage federal spending because of the theory that public works are best constructed when the economy needs "pump priming," he said. In dividing such construction funds as are appropriated now, federal spending agencies fail to differentiate between projects that can be deferred and projects of vital immediate importance.

Establishment of a federal corporation with authority to issue revenue bonds to finance self-liquidating projects would assure construction only of the economically feasible undertakings, he pointed out.

The federal government has a greater responsibility for power project construction in the Pacific Northwest than in other areas because it has assumed dominance in this area to the extent that private capital no longer is a factor.

Such construction is sound not only because of the already-present market but because of its importance in national defense, the Stanford professor asserted. He suggested it might be wise for the federal government to subsidize an excess supply of power for such emergencies and also construct transmission lines to supply the power to widely separated areas.

Dr. Paul J. Raver, Bonneville Power Administrator, addressing the opening-day luncheon meeting, also urged a "management" approach to the programming, timing, and financing of an expanded development of Northwest hydroelectric power.

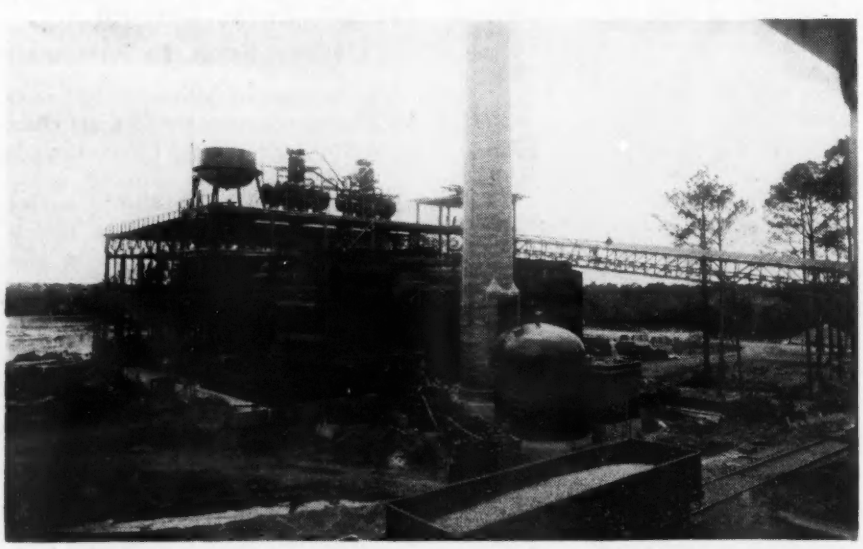
"This program is not a gift from Uncle Sam," he said, but a tool "basic to the free enterprise system."

In view of the non-reimbursable uses of the dams built partially for power, Dr. Raver said, and the long-term risks involved in the reimbursable uses, development of a large scale river system takes more capital than can be privately banked.

However, he said, "If the Federal government is to do the job in the Northwest, it must recognize that the power aspects of the development are basic to the economy of the region and indeed, to the nation. This means that power development . . . must be differentiated from public works in both the planning and budgeting of the federal government. No longer can we build dams for power in this region on a public works basis only."

The importance of additional power supplies in the Northwest was further emphasized by Harry Dibble, consulting engineer of Redlands, Calif. Placing the installed capacity in the five Northwestern states at 3,589,364 kw as of Dec 31, 1947, he predicted that the area could use 8,200,000 kw of installed capacity in 1953 and 10,160,000 kw in 1958.

R. Wayne Lincoln, senior engineer of the Seattle District Corps of Engineers, estimated that the ultimate economical development of hydroelectric prime power in the entire Columbia River basin may reach 17,000,000 kw, with a rated capacity of 27,000,000 kw. The annual benefits of such development would exceed $400,000,000 at current price levels, he said.



PLANT MITCHELL of Georgia Power Co is to have its first 22,500-kw unit in operation in fall, the second next spring. The plant is on the Flint River near Albany, Ga.

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H. K. Ferguson Sets Up Atomic Energy Division

An Atomic Energy Division to specialize exclusively in nuclear engineering problems has been set up by H. K. Ferguson Co, industrial engineer and building firm of New York City. Dr. Karl Cohen, former director of the theoretical division of the Manhattan Project Laboratory, will direct the activities of the new division. Dr. William I. Thompson, formerly a development engineer of Standard Oil Development Co and the Manhattan District Project, will head the division's engineering section.

Projects to be handled by the division are:

1. Participation as a consulting group on atomic energy engineering and construction contracts held by the H. K. Ferguson Co for The Atomic Energy Commission and its subcontractors.

2. Original development in the field of atomic energy to be sponsored by Ferguson.

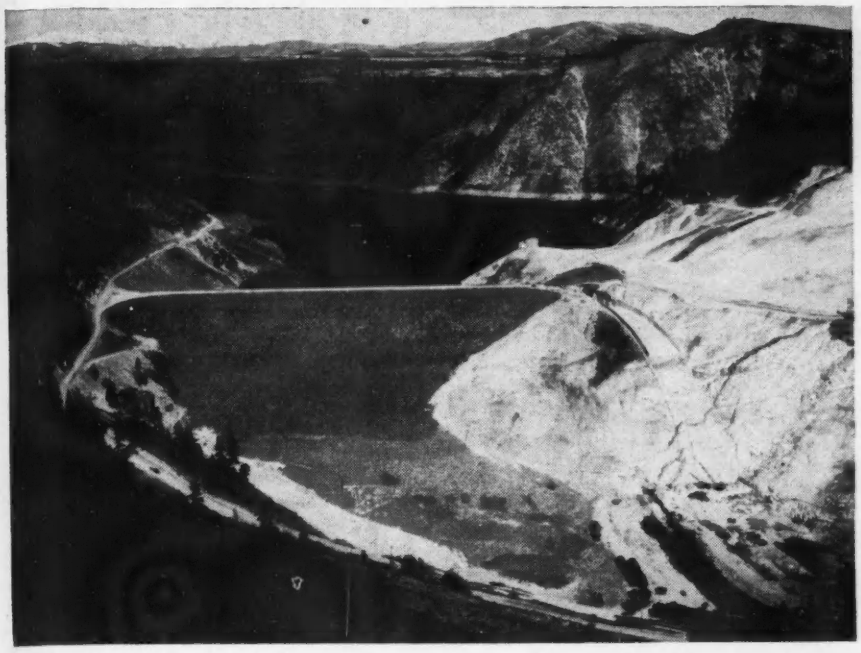
3. The future goal of consulting on a contractual basis for clients who want to investigate the possibilities and effects of atomic energy applications in their industries.

At this time the division will accept contracts only from AEC and its subcontractors. Consulting work for private industry will be accepted later if circumstances permit.

•

'Right Wingers' Win

The "right-wingers" have taken control of Local 248, United Auto Workers, CIO. The union represents employees at the West Allis Plant of the Allis-Chalmers Manufacturing Co. Joseph Glynn has been elected president to succeed Harold Christoffel, Communist leader of the union for ten years, who was convicted this year of contempt of Congress.



CONSTRUCTION is now underway on a powerhouse, spillway, and outlet works which will bring to completion the entire Anderson Ranch Dam project in southwestern Idaho. Initial power installation will be two 13,500-kw generators scheduled to go on line in 1950

REA Loans for Office Equipment and Buildings May Arouse Congress

THEY WON'T do anything about it this year, but economy-minded Congressmen are looking askance at recent loans made by the Rural Electrification Administration. They are wondering just how far the federal government should go in financing groups of farmers who want central station electric service.

Particularly in the spotlight are loan funds approved by REA for purchase or construction of office buildings. Also in question, however, are such REA-finance ventures as purchases of electric appliances for resale to co-op members, loans for trucks, office equipment and short-wave radio communication sets, warehouses and other operations more or less distantly related to actual construction of electric distribution lines.

There is surprisingly little Congressional concern over REA financing of generating and transmission facilities, though loans for these activities are increasing. Survey of a group of loans approved by REA during the week of July 12-16 provides an example of the extent and type of office construction undertaken by co-op borrowers. Of a total of 42 loans, involving a total of some $24,000,000, portions of 10 loans were earmarked specifically for purchases or construction of "headquarters facilities" or for improvements thereof. Total loan funds approved for this purpose amounted to $326,036.

In addition, several borrowers obtained funds for office equipment. Exact amount of these funds could not be estimated, since they were buried in a total of some $115,000 approved for "office, transportation, tools and working equipment."

Top office fund went to a Wisconsin co-op, which received $70,000 for "headquarters facilities." Other individual borrowers received sums ranging from $60,000 to $4,336 for "headquarters." These sums were in addition to funds allotted for electric system extensions or improvements.

One of the smaller "headquarters" funds went to an Indiana co-op to complete, at a cost of $5,200, the "rehabilitation" of its headquarters. The co-op previously had received $15,000 from REA to purchase and improve the structure.

A $50,000 allotment, also to an Indiana co-op, included $43,000 for purchase of an office building, warehouse, garage and 7.16 acres of land, and $7,000 to redesign the front of the office building, install partitions and make other improvements.

With $5,000 an Ohio co-op financed changes of plumbing, roof repairs, and construction of a sidewalk for the borrower's headquarters. A Tennessee co-op obtained $43,500 for headquarters facilities and $30,995 to purchase "office and transportation equipment."

REA officials contend that they are reluctant to finance purchases of office buildings, that they would prefer loans more closely related to actual extension of rural power lines. They admit that applications for headquarters loans are snowballing, pouring in from practically all states.

Though no one in the loan agency will admit it, there is considerable political pressure behind such applications. Congressmen and other politicos from areas where government-financed co-ops are finishing up all major line extensions still want their constituents to share in the huge loan funds now available to REA.

•

Coal Company Formed to Supply Sporn Plant

Organization of the Central Coal Co to supply coal for the new Philip Sporn plant near Graham Station, W. Va., has been announced. The station, now under construction, is being built by the Appalachian Electric Power Co and the Ohio Power Co.

Coal will be moved by conveyor belts direct from the mine to the plant storage bins. Capacity of the mine when operations commence will be 600,000 tons annually. Later this will be increased to 2,500,000 tons.

It is intended that the mine will not only be able to supply the Philip Sporn Plant but also other plants of American Gas & Electric Co.

Docks with modern coal handling facilities will be built on the Ohio River for shipping coal. The docks will also have unloading facilities should it become necessary to secure coal for the Philip Sporn Plant from other sources.

•

Semi-Rationing Gets Kws to Aid Reynolds Metals

Following modification of a ration plan for use of power in air cooling business and industrial houses, the Central Arizona Light & Power Co in Phoenix, Ariz., recently returned to a semi-ration plan caused by overloads.

Stores and office buildings, including the state capitol, were asked to ration power on Mondays in order to supply the Reynolds Metals Plant, formerly closed on that day. The Reynolds plant uses up to 5,000 kw and the system didn't have that much to spare. By staggering business house consumption, the company was able to make up 2,000 kw and meet the emergency.

Braddock L&P Co Plant Still Controversy Center

The Civil Aeronautics Administration's three-cornered dispute with Braddock Light & Power Co and Alexandria, Va., over the proposed height of power plant stacks is taking on comic-opera proportions.

Last week (July 23) CAA representatives met with Alexandria officials in what was supposed to be private parley to work out a compromise. News of the session "leaked" to the press, and reporters swarmed at the scene. Instead of working out an agreement, participants in the parley spent most of the time explaining their views on the issue.

Alexandria officials insisted that the stacks be built at the height presently planned for them by Braddock—193 ft above mean sea level. Any reduction, they said, probably would increase smoke and soot in their city. CAA held to its stand that stacks above 162 ft would create an "obstruction to air navigation" at Washington's National Airport, more than a mile and a half from the plant site.

But this week (July 26) CAA spokesmen said they still felt a "compromise" was possible. The agreement, they added, might call for a "trial" of the stacks at the 162-ft level, with possible extension later if the smoke problem proved serious. CAA will seek further negotiations, it was reported.

In the meantime, Interior Departments National Park Service is holding up, at CAA's request, a permit for the utility to lay pipes across a strip of federal land between the plant site and the Potomac River. The utility plans to take water from the river for its condensers.

Braddock spokesmen and Park Service officials agree that the delay in granting the utility right-of-way privileges is not holding up construction of the plant in its present stages. And there are indications that the Interior Agency will issue the necessary permit in the near future.

Construction of the 160,000-kw plant is continuing. Structural steel for the entire plant is in place, but the utility has not let the contract for construction of the two stacks. It will not do so until the battle over their height is settled.

•

Utilities in Kentucky Protest

Utilities in Kentucky are protesting to the state Department of Revenue the present system under which they are assessed on 80% of their value while other property is assessed at only 50%.

SEC RULINGS

INDIANA SERVICE CORP has been given permission to merge into the Indiana & Michigan Electric Co and then terminate its existence. Both are operating subsidiaries of American Gas & Electric Co which will receive 100,000 additional shares of Indiana & Michigan no par common for its holdings of the 200,000 outstanding no par shares of Indiana Service (Release No. 8325).

NORTHERN STATES POWER Co has secured approval of its plan to buy from Maynard, Minn., its municipal electric distribution and overhead street lighting systems for $25,340 cash. This amount is $4,733 in excess of the estimated original cost of the properties less straight line depreciation. This excess will be charged to the earned surplus account of Northern States (Release No. 8340).

MONONGAHELA POWER Co has been authorized to increase its investment in common stock of Marietta Electric Co and Monterey Utilities Corp, wholly owned subsidiaries. Under the plan Monongahela will acquire 4,000 additional $100 par shares of Marietta capital stock for $400,000. The parent company now owns 4,000 shares of the latter company and a $185,000 open-account claim Monongahela will also acquire 1,800 additional shares of Monterey capital stock for $180,000. It now owns 200 shares and a $146,000 open-account claim. The subsidiaries will use proceeds to pay indebtedness to parent and to finance construction (Release No. 8342).

COMMONWEALTH & SOUTHERN CORP has been authorized to purchase 1,020,000 common shares of Southern Co, a subsidiary, at $10 per share. Commonwealth & Southern proposes to buy the stock with proceeds of recent sale of South Carolina Power Co common stock. The Southern Co, in turn, proposes to invest the money plus $2,800,000 treasury cash in its subsidiaries, Alabama Power Co and Georgia Power Co, by purchasing 50,000 shares of Alabama Power common stock for $5,000,000 and 50,000 shares of Georgia Power common for $8,000,000. The subsidiaries will use proceeds for construction (Release No. 8346).

NEW ENGLAND POWER Co has been authorized to issue $11,000,000, 30-year 1st series B bonds. The proceeds will be used to purchase properties of Bellows Falls Hydro-Electric Corp, $8,650,000, to purchase that portion of the Pratts Junction line owned by the Connecticut River Power Co, $553,960, and the remainder to repay bank loans (Release No. 8358).

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Wins Condemnation Suit

Washington Water Power Co won a condemnation suit brought by Northeastern PUD of Colville, Wash. A $2,500,000 valuation was set on the firm's property in the area, reportedly close to the company's estimate, compared to the $780,000 value offered by the PUD.

MEETINGS

Rocky Mountain Electrical League—Annual Convention, Hotel Colorado, Glenwood Springs, Colo., September 12-15. Ralph B. Hubbard, manager, 558 Gas and Electric Building, Denver, Colo.

Edison Electric Institute—Prime Movers Committee, William Penn Hotel, Pittsburgh, October 11-12; Transmission and Distribution Committee, New Ocean House, Swampscott, Mass., October 11-12; Electrical Equipment Committee, William Penn Hotel, Pittsburgh, October 14-15. H. S. Bennion, managing director, 420 Lexington Ave, New York 17, N. Y.

Indiana Electric Association—Annual Convention, French Lick Springs Hotel, French Lick, Ind., October 13-15. E. F. Hauser, executive secretary, 1414 Circle Tower, Indianapolis, Ind.

Electrochemical Society—Fall Congress, Hotel Pennsylvania, New York, October 13-16. R. M. Burns, secretary, 235 West 102nd St, New York 25, N. Y.

Utility Workers Union of America—National Convention, Washington Hotel, October 15-17. William J. Pachler, secretary, 400 Sixth St, NW, Washington, D. C.

Wisconsin Utilities Association—Commercial and Technical Divisions of Electric and Gas Sections, Pfister Hotel, Milwaukee, November 1-3. A. F. Herwig, executive secretary, 135 W. Wells St, Milwaukee 3, Wis.

National Electronics Conference—Edgewater Beach Hotel, Chicago, November 4-6. R. R. Buss, secretary, Northwestern Technological Institute, Evanston, Ill.

Public Utilities Association of the Virginias—Annual Meeting, Greenbrier Hotel, White Sulphur Springs, West Virginia, November 5-6. A. Bliss McCrum, executive secretary, 708 Kanawha Valley Building, Charleston 1, West Virginia.

National Electrical Manufacturers Association—Annual Meeting, Hotel Traymore, Atlantic City, November 8-13. W. J. Donald, managing director, 155 East 44th St, New York 17, N. Y.

PREVIOUSLY LISTED

American Institute of Electrical Engineers—Pacific General Meeting, Davenport Hotel, Spokane, Wash., August 24-27; Middle Eastern District Meeting, Statler Hotel, Washington, D. C., October 5-7.

American Society of Mechanical Engineers—Fall Meeting, Reed College and Heathman Hotel, Portland, Ore., September 7-9; Annual Meeting, Hotels Pennsylvania and New Yorker, New York, November 28-December 3.

International Brotherhood of Electrical Workers—Annual Convention, Ritz-Carlton Hotel, Atlantic City, September 13-17.

Instrument Society of America—National Instrument Conference and Exhibit, Philadelphia Convention Hall, Philadelphia, September 13-17.

Iowa Utilities Association—Conference, Fort Des Moines Hotel, Des Moines, Iowa, September 20-21.

Illuminating Engineering Society—National Conference, Statler Hotel, Boston, September 20-24.

International Association of Electrical Leagues—Annual Conference, Mayflower Hotel, Washington, D. C., September 29-October 2.

Canadian Electrical Manufacturers Association—Annual General Meeting, General Brock Hotel, Niagara Falls, Ont., September 30-October 1.

Pennsylvania Electric Association—Transmission and Distribution Committee, Bedford Springs Hotel, Bedford, Pa., October 7-8.

Wages and Prices Rise, Manufacturers Announce

Wages in the electrical manufacturing industry are continuing their upward trend. Keeping pace with them are the prices.

Wagner Electric Corp, St. Louis, has raised the wages of some 6,000 employees by 10 to 16 cents an hour. The workers are members of the United Electrical, Radio & Machine Workers, CIO.

UE workers at the General Cable Corp., Rome, N. Y., have approved a two-year agreement providing wage increases of 9 to 15 cents an hour. Minimum pay for both men and women will be $1.19 an hour.

Revere Copper & Brass, Inc, has granted 3,500 production workers of its two Rome, N. Y., plants a wage increase of 8%. Individual workers will get raises ranging from 10 to 18 cents an hour. The average raise will be 12 cents.

General Electric Co has increased the price of mercury arc rectifiers to that of April 19 when a 5% reduction was made. Price readjustments have been made in the line of integral hp induction motors rated 200 hp and smaller. Some were reduced and others increased to eliminate price inconsistencies.

Allis-Chalmers Manufacturing Co has increased prices 5% on electric motors, generators, and motor-generator sets. The increase on electrical controls is 10%.

General Electric Lamp Department announced an increase in list prices of large, miniature, and photo lamp lines, effective July 26. Lamps ranging from 15 to 60-w were increased one cent. List prices of 75 and 100-w were not increased.

Sylvania Electric Products, Inc, also announced changes in the prices of incandescent and fluorescent lamps effective July 29. Though 43 various sizes and styles of incandescent lamps were increased in price, the standard 25 to 60-w sizes were advanced only 1 cent list price. The list prices of four standard Warmtone fluorescents were reduced 10 cents, one was cut 15 cents, and 40-w Soft White fluorescents were cut 15 cents.

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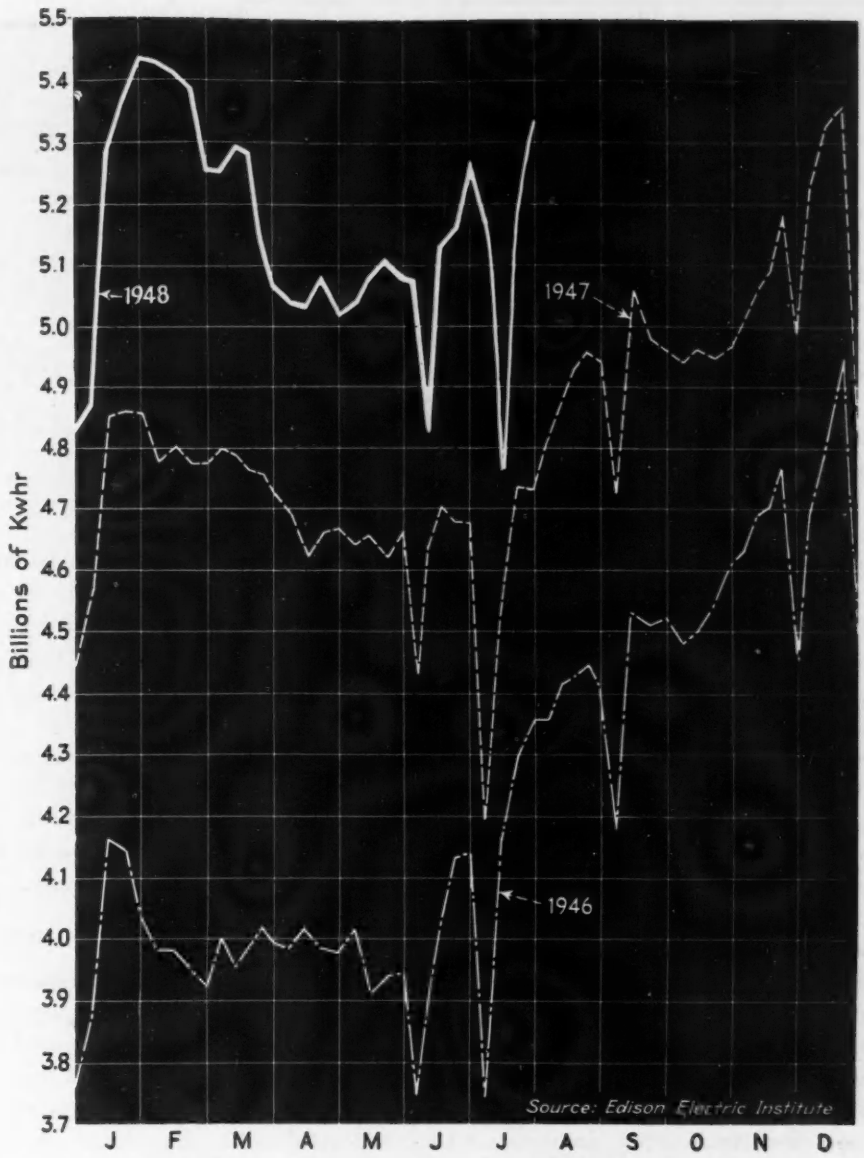
City Gives Franchise

Philomath, Ore., has granted the Mountain States Power Co a 20-year franchise. The utility will pay a 2% tax on gross receipts inside the city and will give the city 200 kwhr monthly for municipal purposes.



Arput Picks a Good Man for the White House

ARPUT is a dirty radical. He is against Truman, Dewey, Wallace, Thurmond, Thomas, et al. The trouble with ARPUT is that he is a stooge. Nothing interests him but those output figures.

"Up again," he shouts as he gets the week's total from EEI's Miss Blake. "Nearly 13% higher than last year. Boy that's living—American living. Just stay out of the way of the utilities. They've got 'em—kilowatt hours for all Americans. Cheap, efficient Reddy Kilowatt! What nominee can do a better job of raising the American standard of living?" asks ARPUT. "I've got my own man for the White House—Reddy Kilowatt," he roars.

Maybe ARPUT's nuts. But you must admit Reddy's done a good job. He's on the up and up, like the output.

Other News

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Weekly Output, Millions Kwhr

1948		1947		1946	
July 24	5,342	July 26	4,730	July 27	4,352
July 17	5,197	July 19	4,732	July 20	4,293
July 10	4,760	July 12	4,531	July 13	4,156
July 3	5,166	July 5	4,190	July 6	3,741
June 26	5,257	June 28	4,675	June 29	4,133
June 19	5,159	June 21	4,676	June 22	4,129
June 12	5,132	June 14	4,702	June 15	4,030
June 5	4,845	June 7	4,635	June 8	3,920

Percent Change from Previous Year

	July 24	July 17	July 10
New England	+ 6.8	+ 1.2	—10.1
Mid-Atlantic	+ 8.6	+ 4.9	+ 1.3
Central Industrial	+13.4	+ 9.5	+ 2.6
West Central	+18.5	+18.6	+13.1
Southern States	+16.6	+12.4	+11.4
Rocky Mountain	+ 5.5	+ 4.3	— 0.2
Pacific Coast	+13.3	+13.0	+ 7.3
Total United States	+12.9	+ 9.8	+ 5.1

WASHINGTON COMMENT

WILLIAM B. WHICHARD

POLITICAL SOOTHSAYERS notwithstanding, development of power at the International Rapids of the St. Lawrence River is closer to accomplishment than ever before. The navigation features of the Seaway project, true enough, still are remote, if they ever are to be built. But the joint bid of New York and the Province of Ontario will move ahead despite political complications, if any.

Washington commentators are in general agreement on the theory that the New York-Ontario proposal is part and parcel of Gov. Dewey's campaign strategy and, for that reason, will be blocked, stalled or otherwise impeded by the Truman administration. It sounds good, but like a good many other election-year dope stories, it just isn't so.

Facts of the case are that the Army Engineers and the Federal Power Commission, the federal agencies with primary interest in the project, are speeding the work each must do in connection with the case. Within a week, the Engineers completed the preliminary report for FPC, which is required under provisions of the Federal Power Act. FPC, in turn, set August 26 as final date for filing of protests against the proposal. FPC hearings probably will start a month or so later, if the New York Power Authority can prepare its presentation by them.

As yet, at least, Washington still is a poor spot from which to gauge the Dewey campaign strategy. But if the St. Lawrence power development is to be labeled as a part of Dewey's political ammunition, it is only fair to note that the New York governor has been firing it for years. As governor, he has long insisted that the St. Lawrence be harnessed for power production. His decision to move for state development was announced last April, before he became the Republican presidential candidate—but shortly after the U. S. Senate again voted to shelve proposed federal development of the Seaway.

Actual starting of work on the St. Lawrence power project still is months, perhaps years, away. Only the preliminary steps have been taken. FPC has been asked to approve that part of the project which will come under its jurisdiction—the construction and operation of facilities on the U. S. side of the international border. New York's bid then must clear the State Department, for consideration of diplomatic aspects, and go on to the International Joint Commission for final approval. The Ontario Hydro-Electric Power Commission is putting its application through similar channels in Canada.

FPC's hearings probably will consume most of the time required for legalistic preliminaries, though the IJC also probably will hold extensive hearings. FPC will get many protests—it's that kind of a project. And the commission will wrangle over who is to get the power to be produced, how it is to be distributed, and other aspects of the project. It's that kind of FPC. But national politics will have little, if anything, to do with it.

And it's hard to see any real administration roadblock in the way of approval. Too many people therein, from Truman down to FPC Commissioner Olds, have made too many demands for St. Lawrence power. With federal development an acknowledged political impossibility, it would be the worse sort of campaign propaganda to turn down the New York-Ontario plan on the basis of "it-isn't-the-way-we-want-to-do-it."

TECHNICAL TRENDS

ARCHER E. KNOWLTON

(From papers presented at the recent Conference des Grands Reseaux Electriques a Haute Tension in Paris)

An Alutherm cartridge was used to make joints in a recent 150 kv Swiss line of aluminum conductor. They involve no use of welding current, flame or fluxes. Peraluman sleeves reinforce the annealed strands.

Tower legs on a recent French transmission line consist of concrete-filled tubes. Verticals are vibration-filled after erection, horizontals beforehand. Metal takes the tension, concrete the compression and fewer braces are required. Savings are reported to be 8 to 14% of the overall line cost.

Carrier frequency crowding (in the 25-300 kc band) on French transmission lines is to be alleviated by selectivity, stabilization, narrowed band width, improved traps and reduced transmitter output. Preference is for A-M, carrier suppression, steep-characteristic filters and interphase coupling.

Reclosure on Swedish 11-44 kv lines with arc suppressor clears 82% of the faults and subsequent manual or automatic reclosure generally succeeds (after a 3-minute interval) in an additional 14% of cases.

Reflected impulse wave timing on two Belgian transmission lines resulted in locating the two-line fault within 500 feet. The indications interpreted four conductors as being on the ground, one broken and one unaffected.

Water crossing span of 10,600 feet is planned for the projected Strait of Messina tie. Tension on the 84-strand 1-inch steel conductors will be regulated by counterpoise so as to permit stressing the cable to best advantage.

Ground resistance to heavy impulse currents may, it has been asserted, be only 1/5 the value determined by weak current tests. Recent tests in Sweden and Greece confirm the hypothesis that the reduction is due to short-circuiting of the resistant paths by discharges in the high-gradient area adjacent to the point of grounding.

BUYING WHAT IT IS SELLING, Toledo Edison is relighting its branch offices. This is the sales floor of district headquarters in Defiance

Selling Planned Lighting...Why and How

THE TOLEDO STORY

FRANK R. INNES
Associate Editor
ELECTRICAL WORLD

LIGHTING SALES increase revenue faster than they increase load. More load may not be desirable these days. But if taking on a little more load means gaining a lot more revenue—?

Seems like almost every electric utility in the country would be latching on to a bargain like that. Some are, but most are not. We found that out for sure—we had more than suspected it—when we first started to work on the lighting project from which resulted the 6 following articles.

The idea was that we'd dedicate our "lighting issue" this summer to telling how the Planned Lighting Program was being put to work. Inquiring around, we collected the names of a few power companies doing a good job selling lighting and from whom we might get material for the articles we wanted. The fact that we collected only a few names was evidence that not many were taking advantages of the "bargain" above mentioned. More evidence is in the fact that although 126 companies have ordered some of the plan books, mailing pieces and other sales helps offered in the Planned Lighting Program, only a very few have bought very much of that material. Most companies seem just to be nibbling around the edges of the Program.

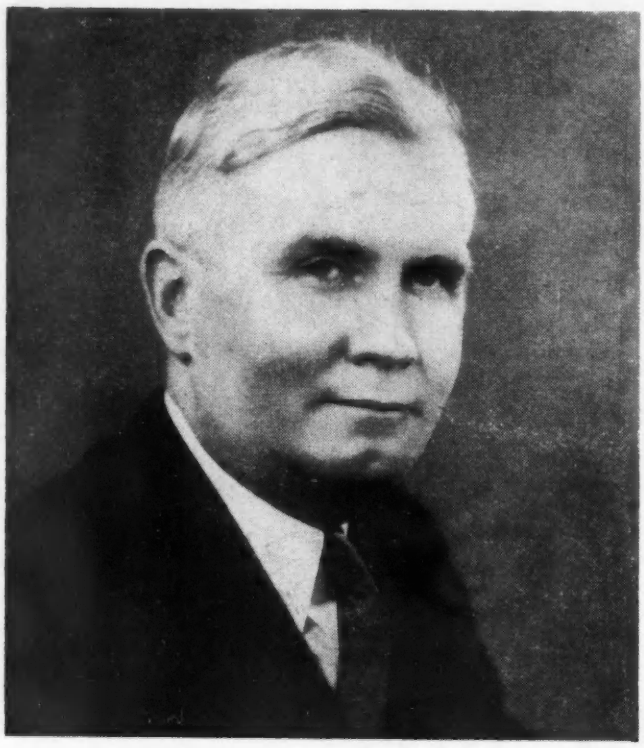
All the more reason then, for Electrical World to print a batch of articles to prove that selling lighting now is a paying proposition. So we went to work. The way the job finally shaped up, we felt we could do most to promote the Planned Lighting Program by presenting the details of one company's experience in a sort of case history. The result is the story of the Toledo Edison Co.

Toledo Edison's activities do not constitute a completely balanced lighting sales operation. Local reasons have prevented any large development of the office and school lighting markets. Home lighting is still a job for tomorrow. But Toledo Edison has done enough, more than enough, in the commercial and industrial fields to prove beyond the well-known peradventure of a doubt that lighting is the most profitable service a power company can sell today.

Profitable is the word. When a dollar of sales cost produces $7 of revenue, that is profitable business. Toledo Edison did that in the 12 months to April 1, 1948. Moreover the added lighting load, in comparison with the very large revenue increase it brought in, made very small demand on peak capacity. And moreover again, the company could not have engaged in a more sincerely applauded sales activity, judging from the reactions of customers and of the local trade.

These and other points, with figures to support them, evidencing the value of the Planned Lighting Program, are clearly brought out in the following pages. Also told are how Toledo Edison sells lighting and how it is planning to sell more.

This one company does not stand out alone as the peerless performer in lighting sales. There are others that have done as well. Some, possibly, have done better. To those vice-presidents in charge of sales who, after reading this Toledo story, can say their companies have done as well or better, we offer heartiest congratulations. To the others who can't say as much, we recommend a line to be found in Barlett's "Familiar Quotations." It reads, "And all may do what has by man been done."



CHARLES E. IDE

Market receptivity, customer protection and self protection, small demand on peak capacity, availability of equipment, . . . all of these are valid reasons, but the habit of selling is the real push

Why We're Selling Lighting Now

CHARLES E. IDE
Executive Vice-President and General Manager
Toledo Edison Co

IN THESE DAYS of capacity problems, huge industrial power demands, appliance uncertainties and sales personnel shortages, lighting again has become one of Toledo Edison's most prominent sales activities.

This is not just happenstance. We are doing it on purpose. And we have these very good reasons for it: (1) Lighting equipment is available. (2) It is a desirable load. (3) It requires a low customer investment per unit of load. (4) Sales acceptance is at all-time peak. We have followed this policy since the end of the war and the results are gratifying. We know it has increased both our kwhr sales and our revenues.

We are not in the fixture business. We sell illumination and let northwest Ohio dealers and contractors take care of the fixture and installation end. But we do press for the highest levels of illumination consistent with our customers' needs and we know this sort of sales activity pays off.

One reason we are so strong on lighting promotion now is that it was the first kind of selling that we could get into after the war. There was a waiting market. Lighting equipment was about the first form of electrical consumer goods to become available postwar. Except in priority applications, fluorescent lighting had been held from people who wanted to use the new light source. We started selling lighting because of these factors and we have kept on selling it because it is good business.

We knew, of course, that our customers were going to use fluorescent lighting whether or not we sold it to them. Someone else would sell them on the fluorescent idea if we didn't. We had a choice of seeing it sold on a "Cut-your-bill-in-half" basis or of selling it ourselves in terms of the high standards of illumination which we think our customers want.

The second reason, which has since proved to be the most important, involves the characteristics of the lighting load in relation to our system conditions. We are in the same boat with most of the rest of the industry as regards capacity. Last December our peak was 224,000 kw. We had 230,000 kw of generating capacity in our own plants. We have ties with neighboring systems and they would have helped us out in an emergency if their capacity permitted. But our neighbors had heavy loads, too, so all of us were pretty much on our own except under emergency conditions.

In comparison with the benefits to be had from it, the addition of new lighting load would not increase our peak load greatly. Our system curve has two daily peaks through most of the year, 10 AM and 2 PM. The morning peak usually is higher. More lighting load would add little or nothing to those peaks. In midwinter the system has a third daily peak at about 5 PM caused by the coincidence of cooking and lighting load on top of the industrial and transit loads. But this peak is lower than the other two and it can stand a whole lot of lighting load-building.

Thus we decided we could—and are convinced we still can—go all out on lighting promotion without endangering our capacity position.

The third reason for our emphasis on lighting is a customer consideration. Ranges, refrigerators and other heavy appliances require a considerable customer investment per unit of power used. Lighting requires a relatively small outlay and produces a proportionately greater revenue.

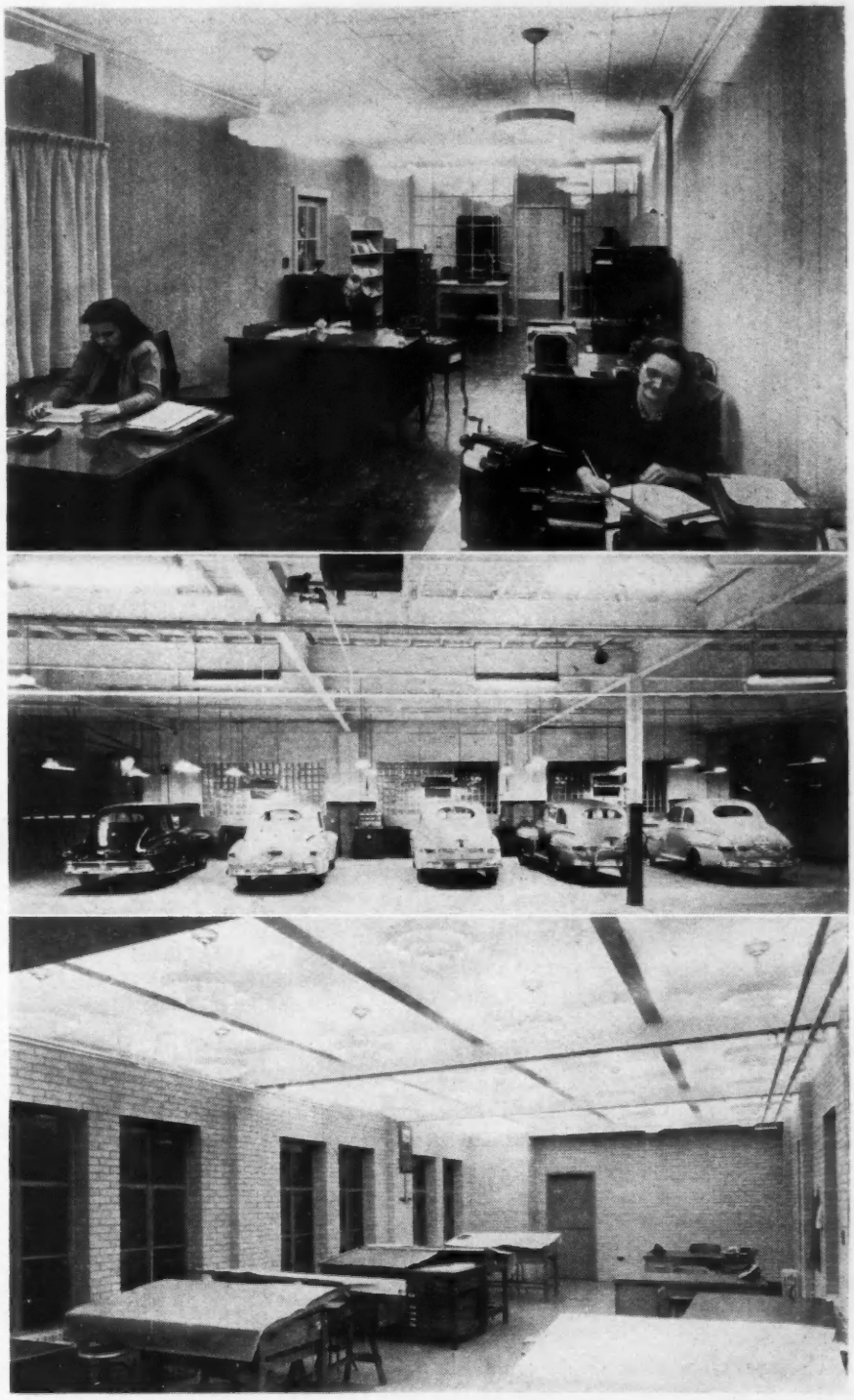
There is a fourth reason. It had no part in our original decision, but became apparent later. It is that the best time to sell something is when your prospect has the money to buy it. This is especially pertinent in commercial lighting. Competition has made the merchant realize the important role good illumination plays in modern merchandising. He has the money now and is willing to buy illumination. It is not so hard now to sell lighting up and down Main street as it used to be or perhaps will be later.

Background Consideration

These four reasons look pretty good to us in Toledo Edison. They may or may not appear so cogent to other power companies. They should be considered against the background of our system conditions.

Toledo Edison serves 2,500 square miles of territory in 10 counties in northwestern Ohio. About 85% of total energy sales are in the highly industrialized Toledo metropolitan area. Sales in 1947 were 1,153 million kwhr, 70 million more than the previous record of 1,083 million in the war year, 1944. In that year the peak load was 192,000 kw, 32,000 under the 224,000 kw peak of 1947. At the end of 1947, customers totalled 145,000—110,000 residential, 18,000 rural and farm, 15,000 commercial and 2,000 industrial and other —round figures. In proportions of total energy sales and total revenue respectively, the customer classes were, in 1947: residential, 17.21% of energy sales and 26.70% of revenue sales; rural and farms 3.46% and 5.74%; commercial, 12.03% and 17.92%; industrial and other, 67.30% and 49.64%.

Possibly our reasons for lighting promotion look good to us because Toledo Edison always has believed firmly in aggressive load building and has worked hard at it. Evidence of this is in our residential business averages. For the 12 months ending May 31, 1948, energy sale was 1,774 kwhr and revenue was 53.70 per customer, both well above the national averages, and revenue per kwhr was 3.026, comfortably under the national figure. These averages testify to the results of selling. And when we consider the high cost of system expansion at present prices—we are glad indeed that our sales program is so set up that we are promoting the sale of the higher rate energy.



TOLEDO EDISON BUYS WHAT IT SELLS. When it told the Bauer-Harrington Service Garage (center) and the Commerce Paper Co (top), that modern lighting would improve efficiency, accuracy and employee moral, it was talking from its own experience, as in the power plant engineering office (bottom)

Commercial revenue upped $7 per dollar of sales cost . . . Selling is getting harder and will cost more . . . Need for increased personnel . . . Home lighting promotion marking time

C. A. HARRISON

Lighting . . . Today's Best Revenue Builder

C. A. HARRISON
Vice-President in Charge of Sales
Toledo Edison Co

AN INCREASE in average annual usage per commercial customer of 1079.7 kwhr. That's what our figures show for the twelve months ended March 30, 1948. In the previous twelve months the increase was 716.9 kwhr, nearly twice that of any earlier year. In the two years, April 1, 1946-1948, we raised usage per commercial customer from an average of 7124.5 to 8921.1 kwhr, more than 25%. By far the greater part of this increase resulted from selling lighting.

The average revenue per commercial customer rose from $212 for twelve months ending April, 1946 to $259.61 for the same period two years later, nearly 18%. This represents a 2-year increase in total commercial customer revenue of $750,000. The cost of running our commercial sales department in the twelve months to April 1, 1948, was about $65,000. The parallel increase in revenue was over $430,000. Our selling cost was multiplied about seven times in revenue. Is it necessary to ask why we believe in selling lighting?

Commercial lighting has a comparatively high load factor. Our system has a daytime peak maximum. It was 224,000 kw in 1947. It occurred on a dark winter morning and undoubtedly lighting was an important contributor to it. But no other peak kilowatt was bringing in anywhere near as much revenue as the lighting kilowatt, because both its load factor and its unit rate are generally higher than the rest. In comparison with its revenue significance, the peak responsibility of lighting dwindles in importance.

It is quite possible, perhaps probable, that beginning next winter our peak load will occur in the evening with lighting a much larger proportion of it than now. This may happen despite the fact that we serve a highly industrialized area. The trend of our load increase is definitely in that direction. We are not displeased with the prospect. Our production department will certainly not grumble if the system peak again becomes dominated by a load of such seasonal characteristics as to allow comfortable scheduling for inspection and maintenance of generation equipment.

Our best efforts in selling cannot make lighting the dominant determinant of peak load right away. It would take a few years to accomplish that result. By that time we should have enough new capacity installed that peak loads will not be the worry they are now.

The situation sums itself up like this: we are selling lighting today and getting back our selling cost about seven times in revenue. In relation to its revenue value, lighting load is not making large demand on peak capacity. The addition of lighting load will have desirable effect on system load conditions. By the time that we can make lighting the dominating component in peak load, if we ever do, we shall have plenty of capacity to handle it comfortably. There-

fore, there will be no let-up in our lighting sales effort; we'll increase it as much as we man.

As a matter of fact, we'll have to increase our sales effort if we want to maintain the rate of the past two years in energy usage and revenue improvement. We've only been skimming the cream of the business potential really. In the industrial field the greater part of our additional lighting load has come from plant expansions and as incidental to other improvements in production facilities. We have done little in selling lighting as relighting on its own merits. Pretty much the same is true in the commercial field. After being held back in the war years, expansions and improvements in commercial premises have just naturally carried lighting along with them. Also, much of the commercial lighting load added since the war has come from the larger and more progressive establishments. We have not had to go out into the highways and byways to sell lighting. As for the residential field, that has hardly been touched since the war. It remains a job to be done.

Selective Selling Needed

That higher revenue load should be developed in both the commercial and residential customer classes of Toledo Edison is indicated by their sales and revenue ratios. With no rate reductions having been made and with load increase uniformly distributed among the customers, changes in sales and revenue ratios in any customer class over a given period should reflect changes in unit revenue caused by energy usages at different steps of the rate schedule. Change in revenue ratio out of reasonable line with sales ratio should call for consideration of its cause.

Toledo Edison residential sales in 1941 were 18.27% of total sales. Residential revenue was 34.24%. In 1947 the ratios were 20.66% and 32.44%, respectively. The sales proportion rose 2.39% and the revenue proportion dropped 1.8%. The probability is strong that the reason for these disparate changes in the ratios is increase in usage of energy by larger customers on the lower steps of the residential rate schedule. Load build-

TYPICAL OF THE MARKET FOR MODERN LIGHTING is the condition disclosed by these 3 pictures of the library of the University of Toledo. Small heed was paid to lighting requirements in the original installation (top) which consisted of wholly enclosed units each containing 6 60-watt lamps. Maximum intensity was 6 ftc and minimum was 2. Then in 1940 the lighting was improved by installation of 500-watt indirect units (center). Intensity was raised to a maximum of 15 ftc; minimum, 12. Connected load was increased about 35%. In 1944 the Navy, then using the school for V-12 training, revised the lighting again, but did not greatly improve it, by installing fluorescent units, each of 4 40-watt bare tubes. The maximum intensity under units was raised to 20 ftc, but the minimum fell to 5, averaging about the same as before, about 14, but the connected load was cut back to about the same as in the original installation

WHAT GOOD LIGHTING does for the customer. In 4 months after providing 50 ftc on the front row of cars this dealer moved from 29th to 3rd place in dollar volume of used cars sold in Toledo. In 8 months he was in 1st place. Since then this dealer has never gone below 3rd position and his example has sold many other high intensity installations in used car lots throughout the general Toledo area

Ratios in Annual Totals—Toledo Edison Company

Year	Commercial		Residential	
	Sales, %	Revenue, %	Sales, %	Revenue, %
1941	12.27	19.42	18.27	34.24
1942	10.74	17.49	17.77	33.62
1943	9.03	15.38	16.46	31.95
1944	8.45	14.74	15.82	30.85
1945	9.55	15.59	18.14	32.50
1946	11.26	17.43	20.19	33.58
1947	12.03	17.92	20.66	32.44

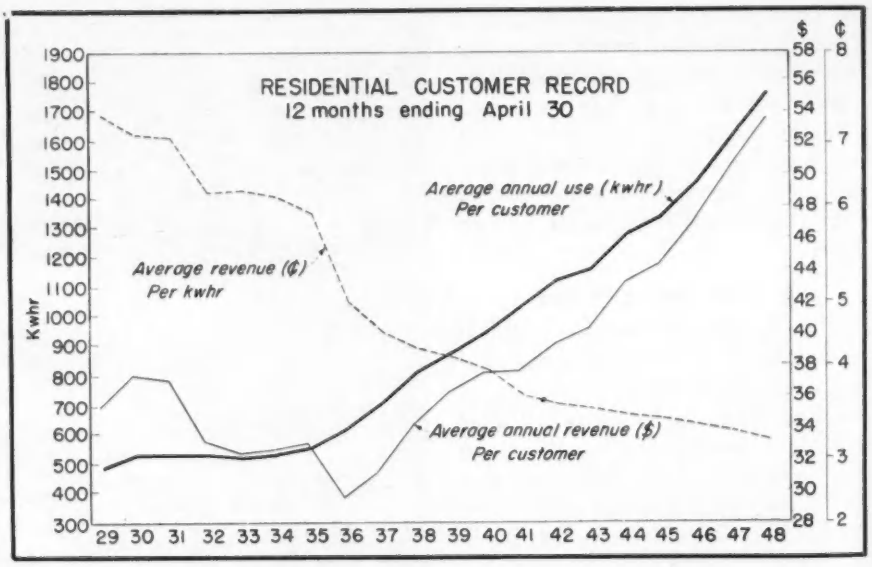
ing should be directed toward increasing revenue from small-load customers. And that means selling lighting.

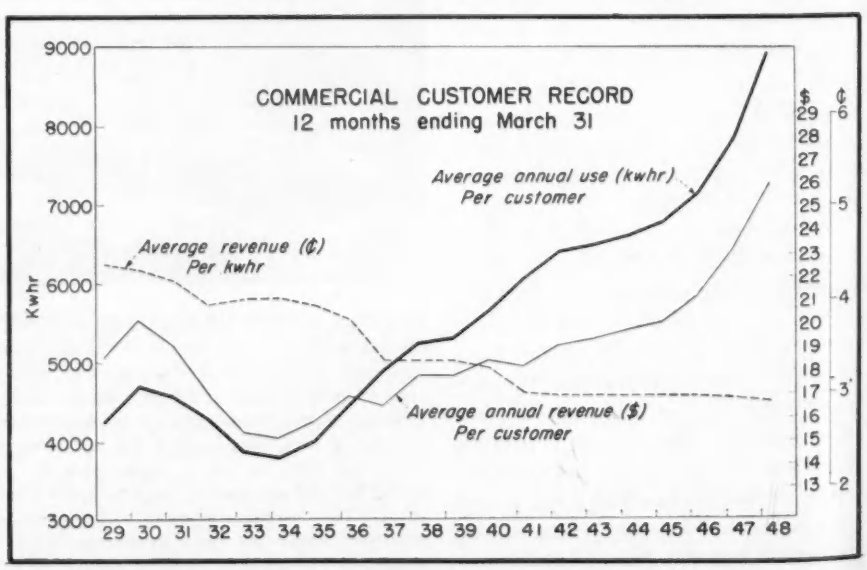
Although not so glaring, the same condition is apparent in the sales and revenue ratios of the commercial customer class.

What is Toledo Edison doing now in selling lighting? As much as we can, not as much as we'd like, not as much as we shall. Our principal lack is qualified personnel. At the moment that lack is not felt so acutely as it would be if we had generating capacity waiting for load. We are keeping our eyes open for qualified candidates for lighting sales employment, but we are not beating the bushes for them. In the commercial department we have four lighting salesmen for the about 9,000 customers we think are worth working on at this time. We expect to add two more soon. Right now we have only one man specializing in industrial lighting for about 550 customers of size to warrant such attention. We had two until recently and are looking for a replacement.

Just before the war we had twelve advisors on home lighting. The staff now consists of six who remained with us through the war years. We'd hire more women as home lighting advisors now if any promising candidates came looking for employment. But we are not trying very hard to enlarge the staff right now because we do not believe the situation in regard to availability of home lighting equipment is such as to justify extensive activity. We hope it will not be too long before we can get back into home lighting promotion on a scale comparable to our activity in the late 30's when we had 20 or more home lighting advisors.

By our experience so far, by the results we have already obtained, and by our analysis of probable future conditions, we in Toledo Edison are convinced that lighting is, and will be for some time to come, about the most rewarding field of sales activity in which we can work. And we are acting on that belief.


RESIDENTIAL CUSTOMER RECORD
12 months ending April 30
Average annual use (kwhr)
Per customer
Average revenue (¢)
Per kwhr
Average annual revenue ($)
Per customer
Kwhr
$
¢
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48


COMMERCIAL CUSTOMER RECORD
12 months ending March 31
Average annual use (kwhr)
Per customer
Average revenue (¢)
Per kwhr
Average annual revenue ($)
Per customer
Kwhr
$
¢
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48

BRIGHTEST OBJECT within six blocks, this hamburger palace draws customers like a magnet. That was the purpose for which its 16.5 kw of lighting was installed

More Selling Needed To Sell More Lighting

Large amount of new commercial lighting already sold; more remains to be sold—More sales personnel needed—Office and school market development still in early stages

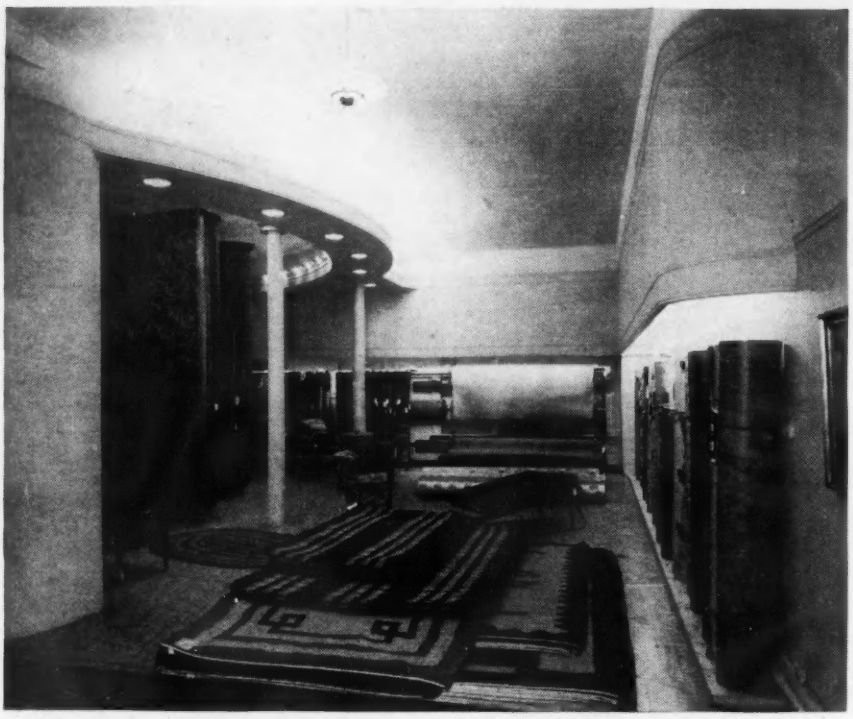
H. E. CARNEY
Director, Commercial Sales
Toledo Edison Co

BIGGEST YEAR for Toledo Edison in commercial lighting sales was 1947, 5,276.29 kw installed. The accomplishment of the first 5 months of 1948 was 1,475.75 kw. This figure would have been larger were it not that for 3 of the 5 months the lighting sales staff had only 75% of its normal man-power. But the principal reason for the slowing up is that lighting was easier to sell in 1947. For equal results, more calls on more customers are necessary now than last year.

This is a natural condition, a thing to be expected. 1947 was the first year since the war when it was possible to get out and really to sell commercial lighting. Equipment became available in quantity and the market was waiting for it. It would have been much more remarkable if 1947 had not been our biggest year. I should have felt that if we could not sell a lot of lighting then, we would not be able to sell very much at any time, in fact I believe most of the lighting was not sold, but was bought, in 1947.

H. E. CARNEY

In the winter of 1945-46, we analyzed the market and made our plans to work it. Our field of operations contained close to 16,000 meters. By eliminating meter duplications on



CUSTOMERS' ATTENTION to rug display at end of long 2nd floor salesroom is attracted by this skillful lighting design

Record of Commercial Lighting Sales

	Kw 1947	Kw 1948 (6 months)
Interiors (stores)	2,476.73	784.33
Schools	136.02	92.80
Offices	210.92	203.67
Show Windows	194.38	77.84
Signs	392.42	231.96
Flood Lighting	1,558.23	527.89
Miscellaneous	411.59	46.87
Totals	5,276.29	1,965.36

Sales According to Light Sources—1948 (5 months)

	Fluorescent kw	Filament kw	Neon kw	Totals kw
Interiors (stores)	394.25	290.48	2.67	687.40
Store Windows	7.49	47.45	7.47	62.41
Offices	140.32	15.96	.....	156.28
Floods	1.70	443.08	.....	444.78
Schools	36.30	39.65	.....	75.95
Special	3.71	25.78	1.71	31.20
Signs	.....	56.90	132.80	189.70
Totals	583.77	919.30	144.65	1,647.72

Sources of Special Calls for First 6 Months of 1948

Customer requests	69
Building permits	104
Employees—other departments	80
Special contact men (door to door minimum group)	65
Restaurant contact man	82
Dealers	12
	412

single premises and by setting a lower limit on customer size we narrowed our prospect list down. The size limit was arbitrarily fixed at 1.8 kw billing demand. It was decided that customers below that size would not repay the cost of selling them. Possibly later we could find some way to reach these smaller customers at a reasonable selling cost, but for the time being we would pass them over.

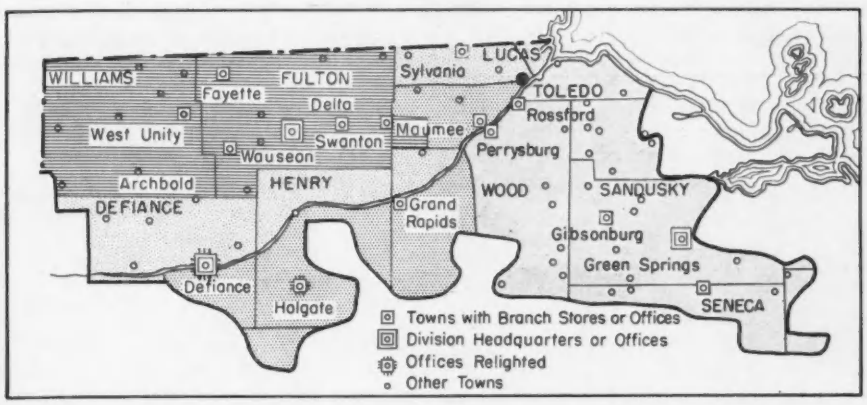
In theory, our commercial lighting specialists operate over all of the Toledo Edison service area as indicated on the map. Practically, however, their work is almost entirely in the city. This has, in effect, still further reduced our list of prospects. The net of all this left us with a working market list containing 8,144 names, of which 310 are architects, dealers and contractors. These are the prospects to whom practically all our sales effort is directed, except that mailings of promotional literature go also to customers in the Defiance, Wauseon and Fremont districts shown in the market distributions tabulation.

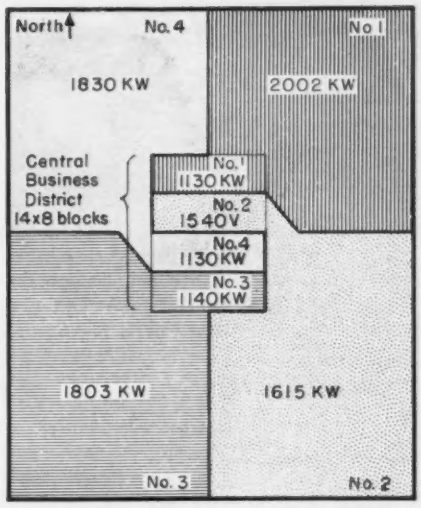
Compared with some other utilities, Toledo Edison has, perhaps, a larger number of customers classified as commercial and a smaller number as industrial. Size or type of service does not enter into the classification. It is rather that commercial customers are those engaged in trade and service operations; industrial, those whose business is manufacturing and processing.

At present the commercial lighting sales force consists of 10 people as compared with 5 prewar. There are four lighting salesmen, two general contact men, one wiring specialist, one school specialist, one clerk and the director. Allocation of sales territories was somewhat of a problem. Working on salary of $200 per month plus $3 per kw of increased connected load, the 4 salesmen should have equal earning opportunities. The problem was solved by dividing the downtown business district and the outlying area each into 4 parts approximately equal in connected loads and in customer numbers. Assignment was by lot, each salesman drawing from a hat slips designating a downtown and an outlying area. There was a little swapping between the salesmen after the drawing and the final result was that each man got a sales area that satisfied him.

The two general contact men work on straight salary. They have no special area assignments, but make regular calls on meter book routes. Their job is to turn up prospects for the salesmen and make themselves useful to customers in all aspects of the company's service. The wiring specialist maintains contact with electrical contractors, consulting engineers and architects. He also operates the Toledo Adequate Wiring Bureau, and makes recommendations for wiring new lighting installations when requested by salesmen.

The Rohrschach aptitude test is used in the selection of new men for the commercial sales department. This is the so-called "blotch" test, the testee telling what he sees in a series of blotches made by folding sheets of paper on blobs of ink. This test is subjective and has no right or wrong answers. It is qualitative not quantitive. Following demonstration of his aptitude for the job the applicant is given a month's training. Typical of the present training is that outlined in





TERRITORIAL ASSIGNMENTS of lighting salesmen outside and inside Toledo

the accompanying schedule. Two new members of the staff have recently emerged from such training.

Except for such work on lighting as is done by district managers and their staffs, who have plenty of other things to occupy their time, little is being done in lighting sales outside the city of Toledo. Each of the four lighting salesmen has a part of the outside district territory assigned to him and is on call when needed by the district manager. Because of the distance they would have to travel, these men, working on commission, cannot be expected to take time out from work in the more profitable Toledo area to make calls in the country towns.

Lighting Business

So far, our lighting sales organization has brought in an impressive volume of business, but obviously the organization is not adequate for intensive cultivation of the whole market in the company's service area. Practically all of the sales to date have been made to stores and other prospects in Toledo. For reasons that will be given further on in this story, the school and office lighting markets have not been worked as intensively as they will be later. Currently, we have in mind to appoint a sales supervisor, and to add to the sales staff for adequate coverage of the small towns.

Additional to our personal contact selling, we are using all of the advertising and promotional material in the industry-wide Planned Lighting Program, and other sales aids, as is shown in the tabulations of mailings. These mailings were used entirely for advertising, not as ways to build up prospect lists by means of return cards or other solicited direct response. Thus we have no quantitative measure of the effectiveness of this promotion, but we are sure it is effective as all good advertising is. The tabulation of sources of leads for special calls in the first five months of 1948 strengthens our confidence on this point. It is to be noted that out of the 314 special calls only the 73 from building permits can be said not to have been influenced by advertising.

Special lighting promotion activities with the local trade and customer groups were undertaken in 1947 and are being continued as occasions arise. There were 7 such activities in 1947. In February we participated with the General Electric Co in three commercial lighting meetings for electrical contractors. Attendance averaged 125. In April we sponsored a one-day meeting of 52 dealers and contractors at Nela Park, "The University of Light." Also in April we staged a dealer cooperative display of ultraviolet and infrared lamps in the show windows of our main office which was remarkably successful. At the IES school lighting meeting in Cleveland in October, 16 local PTA and school board members were present as our guests. In November we sponsored the attendance of 28 school officials at the Nela Park School Lighting Conference.

To date, all that has been done in the Toledo school-system is the installation of six sight-saving rooms and of about a dozen demonstration class-

Breakdown of Commercial Lighting Market

Group*	Toledo	Defiance	Wauseon	Fremont	Total
A Drugs	501	104	58	38	701
Bars					
Restaurants					
B Food dealers	380	50	60	30	520
C Retail & Service	645	70	80	55	850
D Auto and	500	70	110	45	725
Gas Stations					
S Architects	310	8	10	6	334
Dealers					
Contractors					
O Offices	900	....	....	....	900
M Minimum	4636	....	....	....	4636
Accounts					
Schools	100	150	250	100	600
Institutions	172	....	....	....	172
	8144	452	568	274	9438

*Group A, B, C and D include only customers with demands of 3 kw and over

Commercial Sales Promotion Mailings—1947

Group	Mailing Piece	Timing	Number	Postage	Mat'l	Total
Special	Electricity in Bldg(1)	every mo.	3,542	$35.42	$50.55	$85.97
"A"	Food Service News(1)	every mo.	12,012	570.57	120.12	690.69
All	Today's Business(1)	every other mo.	39,873	574.44	1,993.65	2,578.09
All	Ltg. for Business(1)	May (one issue)	7,552	75.52	264.32	349.84
"D"	Check Your Lighting(2)	June	843	8.43	278.19	286.62
"D"	Check Your Lighting(2)	Sept.	758	7.58	250.14	257.72
All	"Are You Getting All the Light etc?"(3)	Sept.	7,643	76.43	210.18	286.62
All	"How to Make Them Stop, Look and Buy(3)	Sept.	7,926	79.26	218.24	297.50
All	"A Service to Help You Get More Customers etc."(3)	Oct.	7,931	79.31	218.10	297.41
All	"1-3-5-10 Can Bring You More Sales etc."(3)	Oct.	7,428	74.28	204.17	278.45
All	"How to Put the Accent on Sales"(3)	Nov.	7,617	76.17	209.47	285.64
All	"What is the First Requirement of a Window Display?"(3)	Nov.	7,322	73.22	201.36	274.58
All	Toledo Story(4)	Nov.	8,028	125.16	1,325.00	1,450.16
Selected	Christmas Cards	Dec.	600	18.00	86.00	104.00
			119,075	$1,793.76	$5,629.49	$7,523.25

(1) Periodicals
(2) Special price for garages and gas stations
(3) Planned Lighting Program
(4) Brochure of new lighting installations in Toledo

TYPICAL LIGHTING SALESMAN TRAINING PROGRAM

June 1—Westinghouse training films and reading. (Employment films, etc.)
June 2—E.E.I. Training films
June 3—A.M. Field work with dept head —PM. Westinghouse training film (problems.)
June 4—A.M. Field work with dept head —P.M. E.E.I. training films
June 5—A.M. General Electric training films and problems
June 7—With special contact man —field work
June 8—With special contact man —field work
June 9—A.M. Sales meeting —P.M. Special contact man, field work
June 10—With department head —Defiance, Ohio, field trip
June 11—With lighting salesman —field calls—problems
June 11—Office detail. Reports, etc.
June 14—With lighting salesman —field calls
June 15—With lighting salesman —field calls
June 16—With lighting salesman —field calls
June 17—I.E.S. regional meeting. Detroit, Michigan
June 18—A.M. with department head —P.M. Feld calls with lighting salesman
June 19—Field calls with lighting salesman
June 21—26 Nela Park —Elementary course in lighting
June 28—Office review and problems —field calls
June 20—With lighting salesman —field calls
June 30—With department head, problems —field calls on own
July 1 and after field calls on own

rooms, the results largely of the activities of PTA and other neighborhood groups. One large grade school of 40 classrooms will be adequately wired this summer and the rooms painted in four colors by the Board of Education. The local PTA will then relight all the rooms, the work to be finished by fall. Demonstration fluorescent installations will be put in two rooms; the remaining 38 rooms will have incandescent lighting. Six types of fixtures will be used in different rooms and each room will have six outlets allowing 500 w per fixture.

That we should give more attention to school lighting is indicated by the fact that frequently our recommendations are reduced by a third or more when installations are made. It is easy to say that these reductions are caused by the desire of school authorities to save money and of a tendency of some dealer fixture salesman to sell jobs down. But the real reason is that we do not have manpower to maintain close contact all the way to completion of installation.

In the 16 months through April 1948, we sold 362.11 kw in office lighting. This was done mostly in buildings occupied by large companies. There remains a large market in multiple tenancy buildings which is now opening up. Many of Toledo's office buildings were served by direct current but have been connected to ac since the war. To reduce and finally eliminate this service is the desire of the company and a policy of no load increases on dc service is followed. Also most of the buildings are sub-metered, the operators retailing to tenants. To sell a few tenants in a building on relighting their offices would put the building operator on the spot. He would be faced with the immediate choice of saying "No" to his tenants or of rewiring the whole building for heavier loads on alternating current service. For this reason we have held off in the past from any large attempt to sell office lighting. Instead we work with the building operators to get them to change over to a-c service and to increase wiring capacity. So far our work has been quite lopsided and we have not been able to exploit all aspects of the commercial lighting market. We expect to do a well-rounded job and are getting set for it. We are sold on selling lighting—Planned Lighting for Profit Load.

Mailing Program 1948

	Jan.	Feb.	Mar.	Apr.	May
"Electricity in Building"(1)	334	324	313	313	313
"Food Service News"(1)	1,345	1,358	1,343	1,274	1,248
"Today's Business"(1)	.....	7,992	.....	7,990	.....
"Adequate Wiring Reporter"(1)	.....	.....	.....	.....	320
"Food Store News"(1)	.....	.....	.....	.....	948

PROPOSED FOR REMAINDER OF YEAR

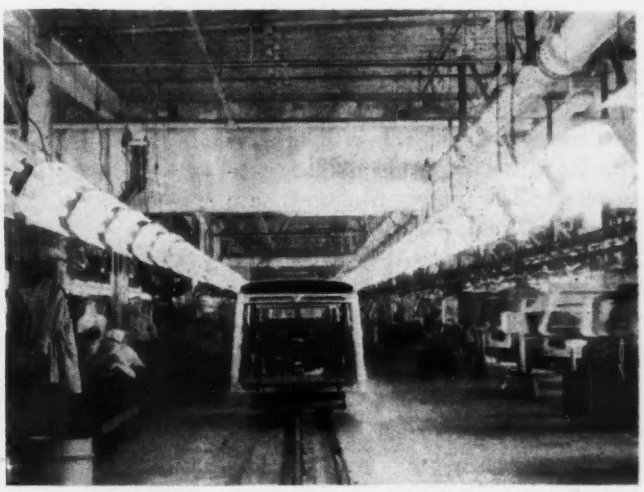
"Today's Business"(1)	Every other month	56,000
"Food Store News"(1)	Every other month	2,700
"Electricity in Building"(1)	Every month	3,960
"Adequate Wiring Reporter"(1)	Every other month	1,980

PLANNED LIGHTING PROGRAM

6 Store Pieces(2)	Sept. to Nov.	45,000
6 Office Pieces(2)	Nov. to Jan.	5,400
4 School Pieces(2)	Dec. to Feb.	2,400
		117,440

(1) Periodicals
(2) Planned Lighting Program

MASSIVE PRESSES require high intensity general illumination for forming operations



INSIDE LIGHT from outside sources facilitates installation of interior trim in Willys-Overland "jeep" station wagons

Industrial Lighting . . . A Selling Job

Wave of post-war plant expansion and improvement boomed industrial lighting in 1946 and 1947, but now selling becomes necessary

MARTIN L. BETTINGER
Power Sales Dep't
Toledo Edison Co

TOLEDO EDISON was among the first utilities to make use of the Planned Lighting Program in the industrial field. Here is why:

As against 1947, 1948 shows a slowing up in rate of increase in our industrial lighting load. For the first 5 months of 1948, the increase was 1282.5 kw. In 1947 the increase for the same period was 1562.6 kw. The rate of increase had dropped to 82% of what it was in 1947. In terms of jobs closed the 5-month comparison is 177 for 1947 and 127 for 1948, a drop to 70%.

This downward trend is more pronounced when we consider the prospective load increases and jobs. In the first 5 months of 1947, the total of load increases in prospect was 1712.6 kw and in the 1948 period was only 940.5, a decline to about 55%. As to prospective jobs, the decline was from 71 to 52, down to 73%.

It is from prospects that new business comes. Therefore, in consideration of the future, towards which all selling is aimed, the decline in prospective jobs and load increases is much more important than any change in the record of closed jobs, which is history.

This slowing up can be accounted for with good reasons. For one thing, the country-wide wave of post-war industrial plant expansion reached its crest in 1947 and is now subsiding. Other reasons in specific reference to the company's industrial customers could be brought forward.

MARTIN L. BETTINGER

But the reasons for the slowing up are not important here. The significant thing is the deceleration itself. It says, in no uncertain terms, that if more industrial lighting load is wanted, more effort must be put into selling it.

It was recognition of this trend that caused Toledo Edison to be among the first utilities to put to work the industrial lighting sales helps included in the Planned Lighting Program. Last December the complete set of 14 direct mail pieces was purchased in quantity sufficient for distribution to 600 selected industrial customers. Mailings were started then and continued at 2-week intervals with the 12 folders, ending with the two booklets, "Facts You Want to Know about Light-Sight Production" and "Here's New Light on Your Office Investment."

No attempt was made to elicit direct response from these mailings by enclosed return cards or otherwise. The mailings were regarded as straight advertising of a continuing service, not as an effort to sell something immediately.

The Toledo Edison industrial sales department has a field staff of 7

men. The territory is divided among five men, each of whom maintains regular contact with his assigned customers. The other two men are specialists, one on lighting and the other on heating. Also one of the five all-use salesmen doubles as power factor specialist when needed.

Cost analyses, lighting installation layouts and unit specifications are furnished to customers at no cost. The lighting layouts do not include wiring diagrams because many customers have their own engineers or electricians who are competent to make wiring layouts when they have plans showing the capacity and location of outlets. Many others have contractors or consulting engineers who work regularly for them and who can incorporate the recommendations of the utility salesman into the working plans for a job.

Typical of the jobs based on power company advice and cooperation are those illustrated. Each was a special problem that required intimate knowledge of the customers' operations for solution. One was the illumination of a battery of huge presses, producing auto body parts. In the line shown in the picture are 27 presses, the largest a 1400-ton, triple-action machine. The room also contains 26 smaller presses. Because of the nature of the work and the layout of the machines, local lighting or anything approaching it was undesirable. Solution was high intensity general lighting provided by combination 400-watt mercury and 750-watt incandescent units. In two rows 40 ft above the floor, in 20-ft lateral and 10-ft linear spacing, the units furnish a maintained intensity of 42 fc. Incandescent fixtures are wired to carry larger lamps if need arises.

PRECISION WORK in the skill division of the Doehler-Jervis plant demands both local and general lighting of high quality

Another picture presents the solution of a different problem. For installation of interior trim plenty of light was needed inside the station wagons on the production track. Portable lamps with trailing cords would be a nuisance and a drag on production speed. Rows of twin 100-w industrial fluorescent units mounted 7 ft high and tilted 45 deg were installed on each side of the assembly line.

The third picture shows how another kind of problem was met. In this room highly skilled men work to close tolerances on precision machined parts. High intensity local lighting is necessary on practically every machine. But plenty of general illumination is needed to create a good balance of brightness ratios to minimize eye strain and its bad effects. Also many scale and die markings were outside the fields of the concentrated local lighting. Maintained intensity of 54 fc is provided by continuous rows of twin 100-w units 12 ft apart and 14 ft high.

These examples of installations and the trend disclosed by the tabulation of prospective and closed jobs indicate the nature and the requirements of industrial lighting promotion.

Record of Industrial Lighting Load Increases*

		Jobs				KW Load			
		Prospective	Cumulative Prospective	Closed	Cumulative Closed	Prospective	Cumulative Prospective	Closed	Cumulative Closed
1946	Jan.	20	20	17	17	306.5	306.5	50.9	50.9
	Feb	19	39	15	32	383.4	689.9	107.0	157.9
	Mar	17	56	20	52	340.5	1030.4	103.0	260.9
	Apr	16	72	23	75	211.1	1241.5	78.4	339.3
	May	19	91	20	95	215.3	1456.8	379.3	718.6
	June	13	104	27	122	169.5	1626.3	197.5	916.1
	July	21	125	33	155	501.4	2127.7	196.2	1112.3
	Aug	12	137	30	185	301.1	2428.8	215.2	1327.5
	Sept	17	154	36	221	115.9	2544.7	152.6	1480.1
	Oct	25	179	39	260	538.8	3082.5	297.4	1777.5
	Nov	18	197	29	289	418.1	3501.6	302.2	2079.7
	Dec	17	214	23	312	443.1	3944.7	219.2	2298.9
1947	Jan	9	9	40	40	139.3	139.3	486.6	486.6
	Feb	19	28	35	75	298.9	438.2	412.3	898.9
	Mar	16	44	30	105	619.6	1057.8	203.3	1102.2
	Apr	13	57	37	142	558.2	1616.0	278.1	1380.3
	May	14	71	35	177	96.6	1712.6	182.3	1562.6
	June	19	90	23	200	477.3	2189.9	156.1	1718.7
	July	7	97	18	218	74.7	2264.6	204.5	1923.2
	Aug	16	113	39	257	236.5	2501.1	300.9	2224.1
	Sept	10	123	17	274	342.4	2843.5	320.9	2545.0
	Oct	21	144	39	313	257.5	3101.0	524.6	3069.6
	Nov	16	160	22	335	102.1	3203.1	375.7	3445.3
	Dec	10	170	22	357	50.5	3253.6	313.2	3758.5
1948	Jan	10	10	26	26	452.6	452.6	320.3	320.3
	Feb	16	26	29	55	176.2	628.8	252.7	573.0
	Mar	14	40	40	95	145.5	774.3	236.8	809.8
	Apr	7	47	15	110	120.2	894.5	310.6	1120.4
	May	5	52	17	127	46.0	940.5	162.1	1282.5

* Load figures are not of new lighting installed but of differences between old and new. In the cases of new buildings, the differences are calculated as between total installation and what it probably would have been if no selling effort had been exerted, or the increase as compared with existing lighting loads in the old buildings of a plant on a watts per sq ft basis.

Ready to Go . . . But When?

Conditions not yet favorable for extensive home lighting promotion . . . Perhaps something like pre-war activity will be possible by fall

MARY E. DODDS
Toledo Edison Co

HOME LIGHTING, which before the war was one of Toledo Edison's foremost sales promotions, is on its way back as an important post-war function.

In the late 'thirties our home lighting staff reached a level of 31 lighting advisors and the average number was 28 during the years from 1936 to 1941. Our Electric Institute—a spacious meeting place for Toledo women's groups—entertained hundreds of women and at each meeting the story of home lighting was told.

Throughout the war we maintained a staff of homelighting advisors, but of course it was substantially depleted. We didn't deliberately cut the staff or shift lighting advisors to other work. But wartime attrition—the military services, high-paying jobs for women in other fields and the lack of replacements—cut the staff to about seven.

Right Through the War

These seven kept right on calling on Mrs. Housewife, telling and showing her how best to use light in her home. They were, of course, limited in their recommendations. No longer could they suggest a certain type of lamp for a certain place, or advise the purchase of a more suitable lamp shade. Lamps and lamp shades, all the kinds of merchandise for improvement of home lighting, were unobtainable. But our people could and did expound the "science of seeing," check bulb sizes and illumination levels with their light meters, suggest rearrangements of lamps and in general show the homemaker how to get the most out of the lighting equipment she had.

Even with the low-level wartime operation, our people have made a good record during the last decade. From 1936 to 1947 they made more than 116,000 home-lighting surveys and distributed 121,160 pamphlets dealing with home lighting. The Electric Institute continued to function and to date has had an attendance of more than 146,000 persons representing 2,242 groups.

MARY E. DODDS

Our post-war rebuilding has been slow. In fact today, three years after the war's end, it still is in the advanced planning stage. By early fall it is hoped that recruitment and training of personnel will be far enough along so that we'll be approaching our former scale of active promotion. Even this prediction is uncertain, however, for about the same reasons that were valid just after the war.

First, it is not easy now to hire women with the educational qualifications and the abilities that make good home lighting advisers. Women of that kind are not coming in looking for jobs.

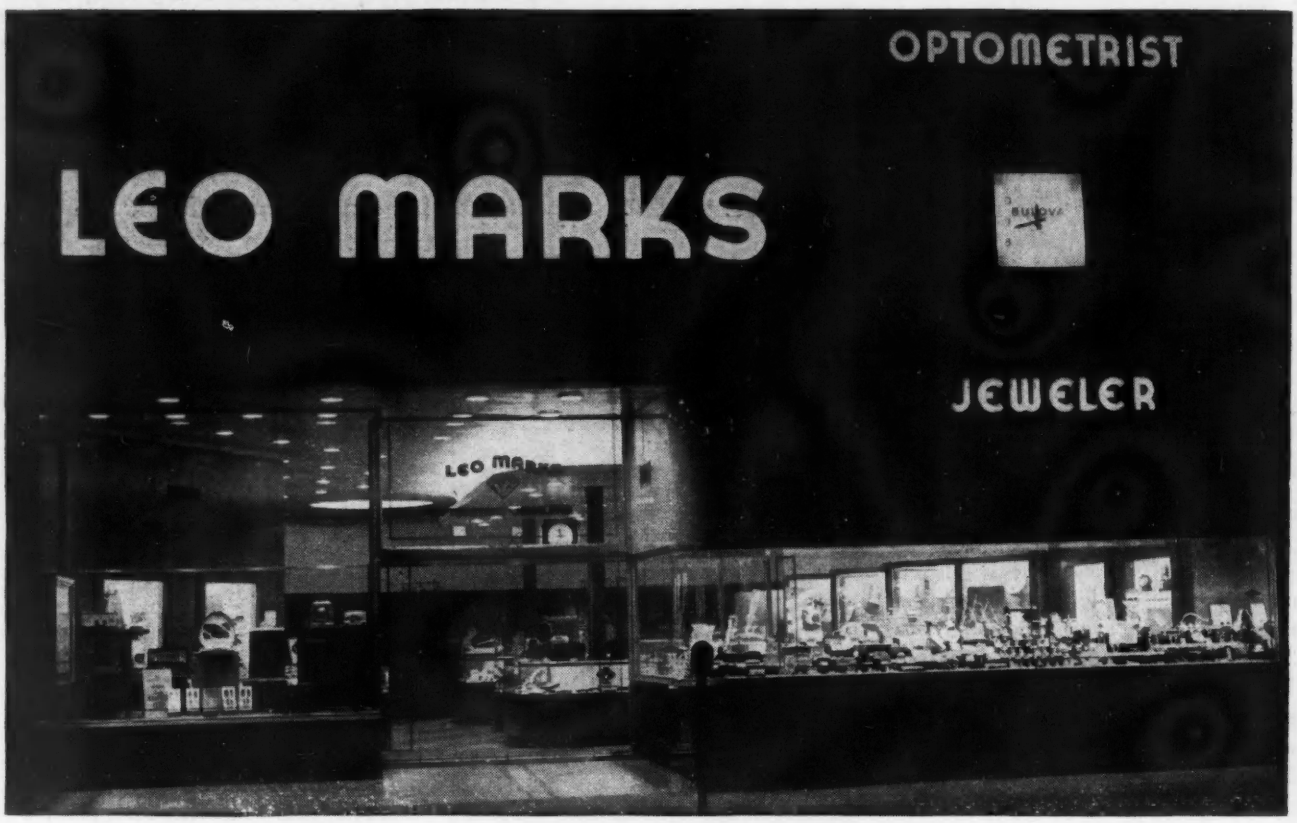
Further, we still are limited by lack of home lighting equipment. Merchandise for improving lighting in the home simply is not available in the necessary quantity, quality and variety.

In comparison with producers of autos, large appliances and other heavy metal goods, makers of home lighting equipment are not significant purchasers of steel and brass and copper. They buy in pounds while the others order in tons. The big users come first and the rest must just tag along and take what they can get. Pretty much the same thing can be said in reference to labor. Skill is required in the manufacture of lighting equipment, but its manufacturers are in a less favorable position in the competitive labor market. The net result is that production of home lighting equipment is hampered and restricted, prices are higher than they could be, and distribution of the insufficient supply is spotty and undependable.

What About Fluorescent?

Another factor is the uncertainty of what part fluorescent lighting will play in our future home-lighting program. Introduced back in 1938, this new type of illumination has been widely applied in the commercial and industrial fields but it has not yet become an important part of home-lighting plans. Granted, there have been many interesting installations in homes, and the lamp companies and fixture makers have done much experimental work. But the fact remains that in the average home among Toledo Edison's 110,000 residential customers and among the 34,000,000 in the nation, fluorescent lighting has not yet made much of a dent.

These are some of the question marks that confront a power company like Toledo Edison when a long-term home lighting plan is under consideration. Meanwhile, we're ready and willing to go ahead as soon as our targets are established and we can set our sights. We have the nucleus of our new home lighting organization and are in position to build it up when these questions are resolved.



BEST-LIGHTED STORE IN TOLEDO is Leo Mark's description of his new installation. It contains 254 units, 137 fluorescent and 117 incandescent, which give him 150 ftc at display points, 75 in aisles, and 60 in his office. His average monthly energy usage rose from 4347 kw-hr in the 6 months, December 1946-May 1947, before relighting, to 3567 in the same period a year later. Monthly billing demand rose from a low of 20 before, to a high of 40 kw after relighting

They Like the Planned Lighting Program

How is the local electrical trade reacting to Toledo Edison's lighting sales activity? . . . Are contractors, architects and dealers happy with it? . . . What does the customer think?

JULIUS C. MEIER
Western Editor
ELECTRICAL WORLD

MANY COMPLIMENTS for the utility, some gripes, and a few suggestions were the results of an inquiry to find out what the local trade and the customers think of Toledo Edison's lighting sales activities.

Without exception customers contacted were well pleased with the end result—the new lighting installation. Many felt that they had received exceptional and unusual treatment. A typical statement from a commercial customer was "Mine is an engineered job and was designed specifically for this store. The basic elements in the planning were so treated so as to make the store and the merchandise appealing to the customer. Sales results since this installation was completed are a definite indication that the boys who planned this job know lighting and its effects upon humans."

Gripes were few and not of a serious nature. In each instance it was a fear that an Edison man was favoring another contractor, wholesaler or architect on some specific job. Upon questioning each admitted that there was no tangible evidence to support this thought. We asked if he would prefer to have the planned program discontinued in Toledo and one complaining contractor's reply was typical. He said "These little difficulties that developed in the inner fighting for a specific job often appear to be mountains when actually they are molehills. To allow them to interfere with a program as basically sound as this one would be unfair to the customer. He is the fellow we are most concerned about. If he is satisfied all of us will ultimately benefit."

Two suggestions most frequently heard for improving the program were: (1) more manpower in both commercial and domestic lighting fields for direct contact work, and (2) establishment of lighting schools similar to cooking schools to study domestic lighting problems at the house-

wife's level, and their solution.

Electrical contractors collectively and individually appear to be supporting Toledo Edison's efforts. There were many indications of close cooperation in working out difficult lighting problems. Clarence Hammer, Secretary, Toledo Electrical Contractor's Association, Inc, stated "it is to the contractor's best interest to work closely with the commercial lighting section of the utility. The prestige of company men is such that customers accept their recommendations almost without question. The company's leadership in lighting is also recognized by the trade. The contractor likes to work on installations planned by the company and he derives a larger profit from them. Costs of these jobs average about 10% more than of unplanned ones. This does not mean that any attempt is being made or has been made to 'load' a job. Actually it means that the contractor finds it is easier to sell a better lighting job than otherwise would have been possible.

"It is not always feasible for the contractor to sell the job as it is laid out. At times the customer's financial resources will not stretch that far. But it would be a serious mistake for the commercial lighting division to recommend a lighting plan on the basis of ability to pay. Specifications should be based entirely upon the quantity and quality of light for a specific purpose. If the basis of drawing up these specifications should ever be otherwise, the whole lighting industry would suffer. It is imperative that utility companies such as Toledo Edison at all times maintain this fundamental principle. This establishes a type of leadership which only a utility should have. We in Toledo recognize this and the contractors here are more than happy with the local situation."

Large, medium and small contractors substantiated Hammer's remarks. Max Romanoff of Romanoff Electric Co said that Toledo Edison's planning and specifications carry a great deal more weight with the customer than do the contractor's. He cited one specific job in which he was interested. The customer "cut the heart out of"

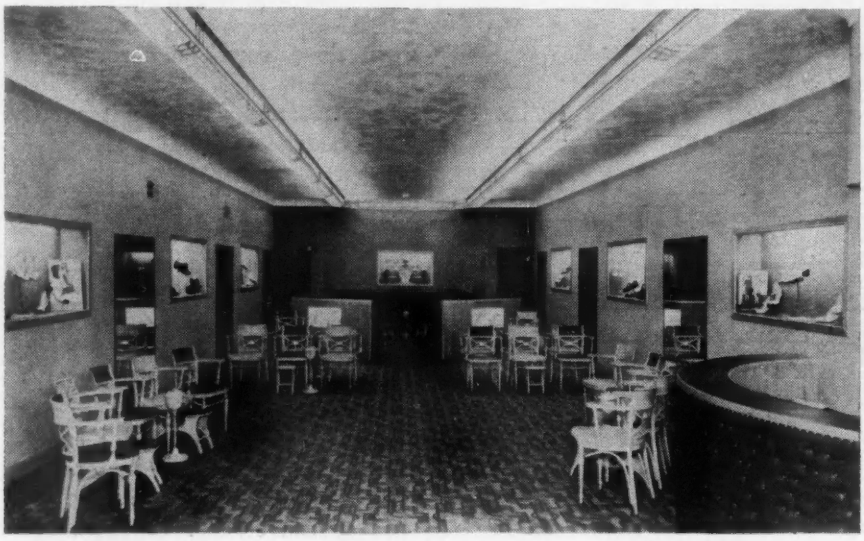
CLARENCE HAMMER, secretary, Toledo Electrical Contractors Association, says that the PL program and the fine cooperation of the local electrical industry in it, will soon make Toledo the best lighted city in the nation

his original plan for a shop and office installation. The Toledo Edison Co was called in as consultant and not only saved the original plan but made several suggestions which materially improved it. The job was installed with those improvements. Romanoff feels that this is one of the most important functions of the utility's commercial lighting department. He stated "it is wonderful to have a place to go when trouble develops. And when these people not only know lighting and fixtures but also can talk circuits and protection it is really a contractor's heaven."

Several contractors indicated that the most important function of the utility lighting engineer was that of keeping them up to date on fixtures and light sources.

One contractor had just completed an interesting experiment by which he attempted to evaluate Toledo Edison's operations. There were eight installations involved in this experiment,—on four he worked alone and on the others he solicited Toledo Edison's assistance. Of the first four jobs, two were lost and the work to date has not been done by anyone. One was installed as planned and the fourth was installed but with an illumination level only 60% of that specified. Of the four in which Toledo Edison participated all were installed. Two were exactly as specified; one because of price resistance was cut 5% in illumination level; and the remaining one is half completed. On this installation the customer was impressed by the plan and desired to follow it in its entirety. However, because of financial reasons this was an impossibility. Therefore, the first floor was installed as planned, and the

LOW INCOME AREA LOCATION does not keep Shamy's Market from being well-lighted. Owner James Shamy says his new lighting has doubled sales volume and halved pilferage losses. Profit from it has already paid for the whole job, which consists of 30 fluorescent units and 4 incandescent floods. For 6 months, December 1947-May 1948, after relighting, monthly energy consumption averaged 2678 kw-hr as against 1448 in the same period the year previous, before relighting. Parallel increase in monthly billing demand was from a low of 2.3 kw to a high of 8.5



SALES INCREASED 300% and returns dropped to 0.1%, says Wilbur Haskins, of HM&R Shoe Co, in praise of this lighting installation. It consists of 40 fluorescent and 47 filament units that provide 70 ftc of general illumination and 125 in windows and wall niches. In the 3 months, March-May, 1948 monthly energy consumption averaged 3567 kwhr, after relighting, as against 2174 in the same period the year before. Monthly billing demand increase was from a low of 12.7 kw to a high of 18.5

second floor will be installed this fall.

Architects spoke very favorably of the cooperation received in solving difficult lighting problems. It was the assistance rendered on the types of fixtures best suited for specific installations that brought the most frequent comments. One architect said it would have been impossible for him to get the necessary fixture data with which to complete his most recent design without utility help.

Customers with but one exception reported complete satisfaction with the new lighting installations. Typical comments heard were: "best lighted store in town," "lighting doubled sales volume," "cut pilferage in half," and "reduced returns and refunds to one tenth of one percent."

One store of particular interest was the Shamy Super-Market which is located in a low-income area. James Shamy, owner of the market, was highly elated with his lighting installation, the part the utility played in it, and its effect upon his standing in the community. His description of just what preceded the installation indicated how the local lighting program operated. A Toledo Edison lighting engineer dropped in one morning and asked Mr Shamy if he would like to make his store the most distinctive in the neighborhood. The reply was "Naturally, but I can't afford a great deal for lighting." He continued, "I listened to a 20-minute lecture on what good lighting for a market was and why I should have it. Since this fellow had made me light-conscious, I later called a contractor who replaced the kitchen-bowl fixtures with an equal number of 40-w kitchen fluorescent units. The Edison lighting engineer called back again, commented on the installations and said, 'You should have a real lighting job.' With this I agreed and suggested that he study the store and make recommendations. This installation is exactly as he visualized it. I bought these fixtures without seeing them. I am completely satisfied with the results. It has increased my sales volume by more than 100% and it has almost completely eliminated the petty thievery problem."

Leo Marks of Marks Jewelry Store and Wilbur Haskin of the HM&R Shoe Store both stated that one of the most interesting results of their planned installations was the comments of customers. Both have had many compliments on the appearance of the stores and the appearance of the merchandise under the new lighting systems. Each believes that his installation "comes as close to daylight as it is physically to do with artificial light." Each indicated that test results of the fixtures in place were almost exactly those estimated by the lighting engineer previous to the installation. With the new lighting shoe sales have risen 300% and the returned merchandise problem has been greatly reduced. Jewelry sales increased 60% the first month after the installation and have increased steadily each succeeding month.

Jobbers and contractors report that the cost of fluorescent lighting is fast becoming the primary cause of lost jobs. Several indicated that this price-consciousness became serious several months ago and appears to be growing. There were also several gripes about the quality of merchandise now being received. One contractor reported that about 20% of fixtures are defective upon receipt and must be returned.

As to home lighting, the reactions of the trade and of customers are about the same as in the commercial field. Toledo Edison's promotional activities were commended. Dissatisfaction was expressed as to quality and prices of fixtures and lamps.

Three of the largest retailers of lamps stated that something must be done on a national basis about the certified lamp program. Articles and advertising materials on rugs and furniture are filling the better women's magazines. Lighting, they indicated, is being neglected. Each complimented the utility for doing more than its share on lighting promotion and in the next breath reprimanded the manufacturers for letting the industry down.

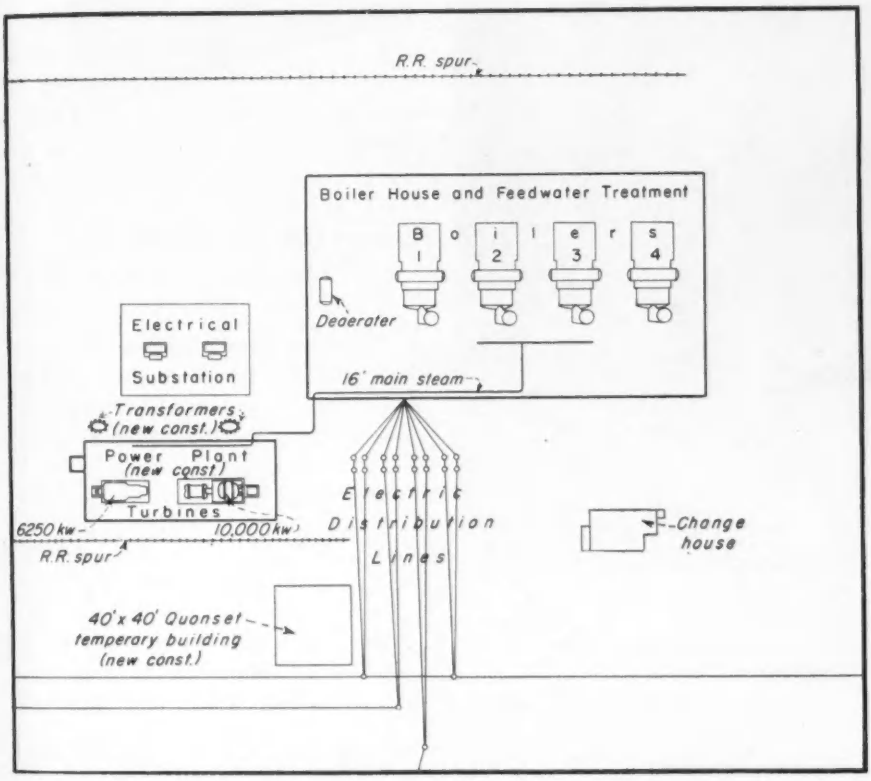
Prospective Entrants in the

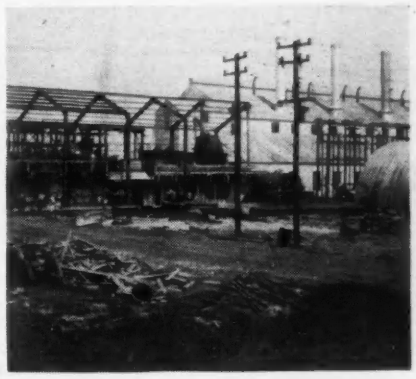
3RD

INTERNATIONAL LIGHTING EXPOSITION MERIT AWARD COMPETITION

are urged to obtain registration numbers for their entries as soon as possible. Terms of the competition and application forms can be secured from Merit Award Committee, Room 818, 326 Madison St., Chicago 6, Illinois.

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN





THE 6,250-KW TURBINE generator, and 10,000-kw unit, above, as they appeared partially erected on the foundations. Heavy parts were handled by locomotive crane from track on near side of building. Building frame has not yet been covered. Boiler room is in the background. General arrangement of leased facilities and new construction, left, at Karnack, Texas, power plant. The water system of the ordnance works ended at a large, ground-level storage tank about 2,000 ft from the plant. Sufficient 36-in. used steel pipe was purchased to extend the existing water system to the turbine room for condensing purposes. The cooling water system has the two condensers in series.

Old Generators In Leased Plant Supply Quick Capacity

J. ROBERT WELSH
Operating Superintendent
Southwestern Gas & Electric Co
Shreveport, La.

To overcome a pressing capacity problem, Southwestern Gas & Electric installed used steam turbines in a leased Army Ordnance Plant at Karnack, Texas. Here, the facilities included a boiler plant with four 100,000 lb per hr boilers generating steam at 200 psi; a substation having two 10,000 kva, 66 to 6.9-kv transformers; and a river pumping station with a total capacity of about 25,000 gpm.

A used 10,000-kw turbine-generator unit, a used 6,250-kw turbine generator, and the necessary condensing equipment and pumps were purchased.

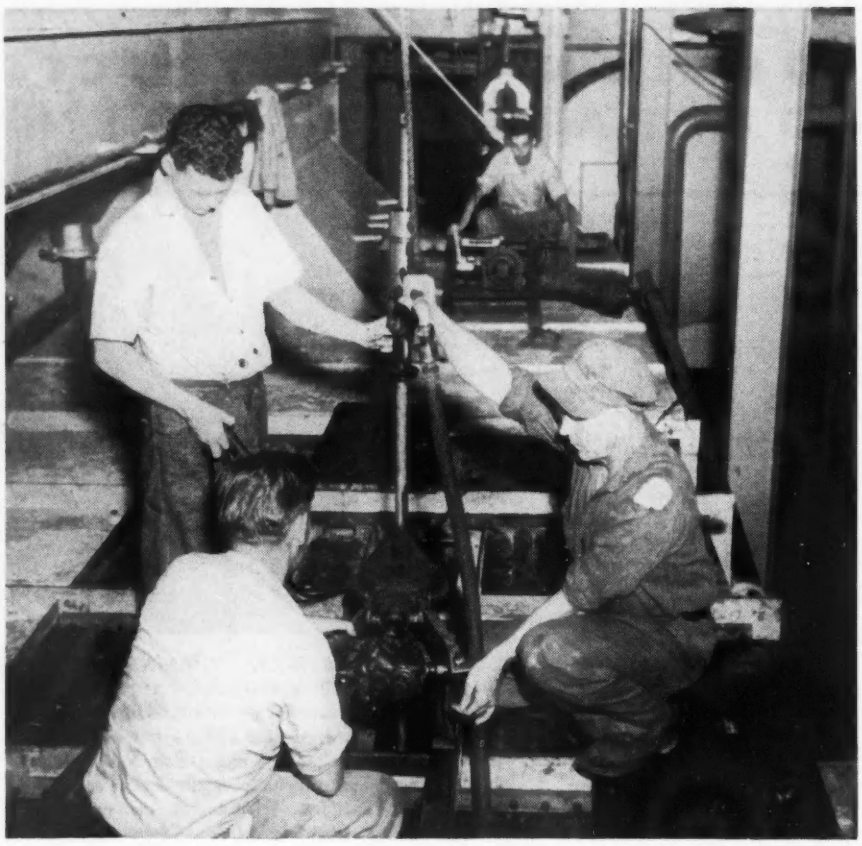
Construction

The general arrangement drawings show the location of the boiler room, substation, and turbine room. The turbine room building is a light steel structure and is not equipped with a crane. To facilitate construction and installation of equipment, a railroad track was built along side of the turbine room. The equipment was installed by using a locomotive crane. This track will be maintained after the plant is in operation. Thus, if any extensive overhauling of the turbine equipment is necessary, a section of the walls and roof of the turbine room can be removed and the heavier pieces then handled by locomotive crane.

The water system of the ordnance works ended at a large, ground-level storage tank about 2,000 ft from the plant. Sufficient 36-in. used steel pipe was purchased to extend the existing water system to the turbine room for condensing purposes. Since the available 25,000 gpm can not supply the requirements of the condenser under the 10,000-kw unit, the cooling water system has been laid out so that the two condensers are in series. Thus, it can be seen that the circulating water discharged from the condenser under the 10,000-kw unit enters the condenser for the 6,250-kw unit and is used as the cooling medium in this condenser.

Immediate Capacity Goal

With this arrangement, the cooling water temperature will be quite high in the condenser of the 6,250-kw unit and the back pressure will be greater than is desirable. But immediate capacity, rather than performance or efficiency, was the goal for this installation. A minimum of 15,000-kw net capacity was needed to meet this definite goal.



THIS INGENIOUS drilling rig in operation at the Inglis power plant of Florida Power Corp, is being operated by W. V. Bertine and Mallory Kirkland, mechanic apprentices, (kneeling, left to right); C. O. Goodlett, boiler operator (holding the drill); and G. A. Bice, assistant boiler operator (running the winch, in the background)

Drilling Rig Made From Salvaged Material

DEVELOPMENT of a drilling rig from salvaged material enabled the Inglis plant of Florida Power Corp. to maintain boiler operations while excess slag was cleaned from 6,800 air heater tubes.

The Inglis power plant, located on the West Coast about 100 miles north of St. Petersburg, has three units totaling 50,000 kw. capacity and uses residual oil for fuel. Sulphur content had been running extremely high since the start of World War II and had presented considerable slag problems.

A new 850 lb. 900 F boiler had been installed in 1946 and this, with a 300 lb boiler, supplied steam for the plant. Slag conditions were noticed to be much more prevalent in the high pressure boilers than had been experienced in the low pressure equipment. Slag conditions grew to the point where it became advisable to shut down the boiler.

Faced with the possible loss of this 300,000 lb per hour boiler, and 30,000 kw of needed generating capacity at the height of the peak load season, employees of the Inglis plant constructed the drilling rig which cleaned the slag deposits without a shutdown.

A 2-inch drill bit was mounted on one end of a 20-ft section of a 1-inch extra heavy pipe, flattened entirely on one side. This pipe was inserted in the gear mechanism of a differential housing removed from a Star automobile, 1918 model. The housing was powered by an air motor, which furnished the rotary motion to the drill pipe. The flexible hose connection furnished air at 90 lb pressure to keep the drillings clear of the bit. The drill pipe was raised and lowered by means of the electrically driven winch.

The cleaning operation was carried on while the boiler was on the line, which made the work most difficult. The air heater top had to be cut out in 36" x 54" sections in order to make the ends of the tubes accessible for drilling.

Cleaning of the 85-ft high boiler involved work on 6,800 air heater tubes, each 19 feet long. The slag had built up so rapidly that it had materially reduced the capacity of the boiler.

Stoppage of the air heater was first noticed last December, and the unit was kept in operation until March 19 by this unusual method of drilling, according to W. J. Clapp, production superintendent.

Emergencies Handled Cooperatively—III *

IN CONNECTICUT the co-operating utilities recognize the safety problem in handling emergency conditions. In time of emergency the power company de-energizes circuits known to be in a dangerous condition. Such information comes from patrols, employees' reports or reports by authorized public agencies. Both types of utilities (power and communication) normally employ all possible means to warn the general public against coming in contact with fallen wires of any kind whatever.

The de-energizing of power circuits wholly or in part to permit work to be done by telephone company personnel is considered by the power company on the other's request. Decision as to whether to de-energize such a circuit is made on the basis of the length and importance of the circuit; also whether by some different method the work may be safely done with the power circuits left energized. Power circuits thus de-energized are not again made alive until assurance is had that all telephone employees are in the clear. Except as thus provided, power circuits which have been de-energized incident to the emergency, either at substations or elsewhere, are re-energized. The re-energizing is done only after having determined by actual patrol that such circuits are in a safe condition. Questions as to whether or not a given circuit is energized and the answers thereto are routed through the co-ordinators representing each involved company.

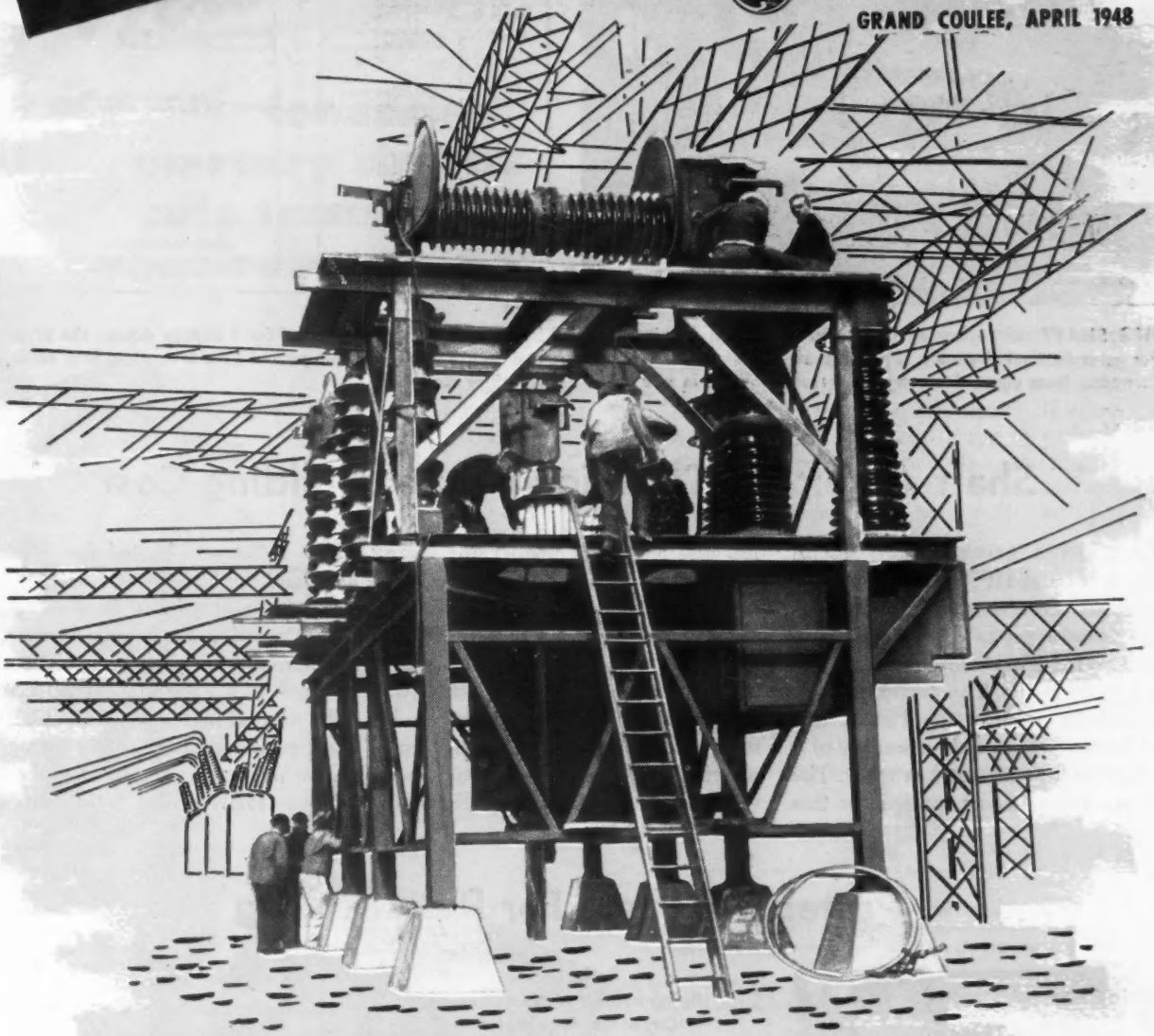
* Concluding a series begun in EW, July 3, 1948, p. 112.

8,700,000 KVA

LARGEST FAULT CURRENT EVER ATTAINED

INTERRUPTED BY A IMPULSE BREAKER

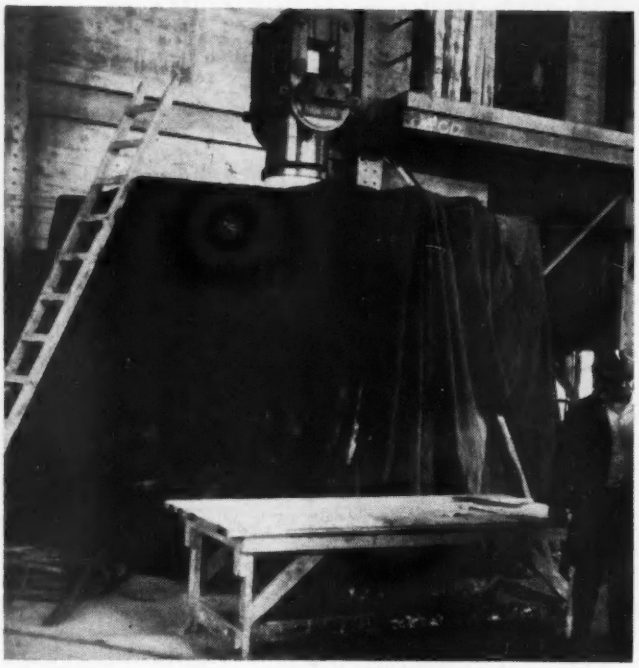
GRAND COULEE, APRIL 1948

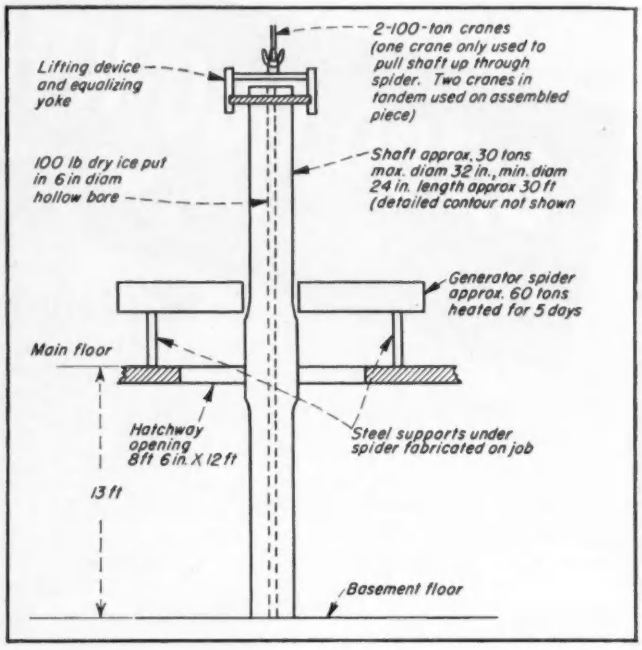


NINE G-E impulse switching units of 10,000,000 kva interrupting rating have been ordered by the Bureau of Reclamation for Grand Coulee. The largest previous breaker rating has been 5,000,000 kva. These completely integrated switching units will include new reclosing-type impulse breakers that are safety-interlocked with group-operated isolating disconnect switches, and bushing current transformers.

Apparatus Department, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC




2-100-ton cranes (one crane only used to pull shaft up through spider. Two cranes in tandem used on assembled piece)
Lifting device and equalizing yoke
100 lb dry ice put in 6 in diam hollow bore
Shaft approx. 30 tons max. diam 32 in., min. diam 24 in. length approx 30 ft (detailed contour not shown
Generator spider approx. 60 tons heated for 5 days
Main floor
Hatchway opening 8ft 6in. X 12ft
Steel supports under spider fabricated on job
13 ft
Basement floor

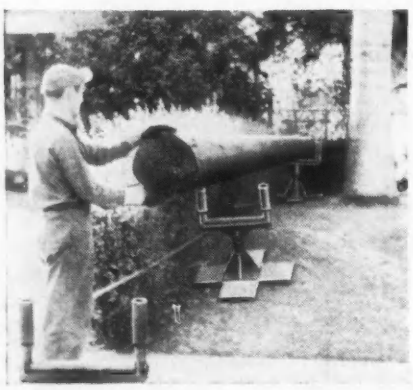
LONG SHAFT of horizontal hydro unit suspended in pit below rotor prior to final assembly. Pulling shaft up into place instead of lowering from above decreases head room required in new plant building. The rotor was heated for 5 days to expand the 32-in. bore, and 100 lb of dry ice was packed in a 6-in. diam hole running the length of the shaft.

Shaft Assembly Technique Saves Building Cost

HEAD ROOM REQUIRED for assembling a long shaft in a rotor can be materially decreased by raising the shaft from a pit below the rotor instead of lowering the shaft into the rotor from above. This technique was successfully used by the Pacific Gas and Electric Co in field assembly of a 30-ft shaft on a 33,000-kva rotor. The decreased head room needed for this job resulted in a considerable saving in construction of the building housing the unit.

The rotor was part of a horizontal assembly with an overhung waterwheel at each end of the shaft. It was set horizontally on the floor on insulated supports as shown in accompanying sketch. The shaft was placed vertically in a pit beneath the floor. The rotor was heated for 5 days to expand the 32-in. bore, and 100 lb of dry ice was packed in a 6-in. diam hole running the length of the shaft. Combination of the two effects resulted in a clearance of 30 mils for the normal shrink fit of 18 mils. With a special double-swiveling lifting yoke attached to the upper end of the shaft, it was easily pulled into position.

Portable Rollers For Pole Moving



PORTABLE ROLLERS used by Los Angeles Department of Water and Power to move poles for replacement on back property line. Adjustable height of brackets accommodates ordinary slopes or terracing

F. L. GOSS
Department of Water and Power
City of Los Angeles, Calif.

DAMAGE DONE by dragging poles back and forth over extensive landscaping of residential areas in Hollywood has made replacing of poles on back property lines a difficult problem. One solution used by the Los Angeles Department of Water and Power employs portable rollers as shown. Supported by a metal bracket on a 2 x 12 in. crosspiece footing, pipe rollers on bottom and sides form a U to accommodate standard utility poles.

Adjustable height of the brackets, which are normally used five to a 40-ft pole, takes care of ordinary slopes or terracing. To furnish power to move the pole a bull line is taken from a winch on the truck through a sheave that is attached to the old pole.

The extreme simplicity and flexibility of this idea, first developed in the field by W. S. Havlin, superindent of the Hollywood district, has saved considerable time and money, and aided substantially in maintaining customer good will throughout the entire system of the Hollywood district.

What's new in GE street lighting

New Relay

for series mercury circuits cuts transformer requirements 45%

Here is a most important development in mercury street lighting—the new Half-load Relay which solves the problem of starting mercury-vapor lamps on series circuits in cold weather. This relay eliminates the necessity of providing, for cold weather starting, approximately twice the constant-current-transformer capacity required for warm weather.

RELAY OPERATES WITH CONTROLLER TO SHORT OUT HALF THE CIRCUIT

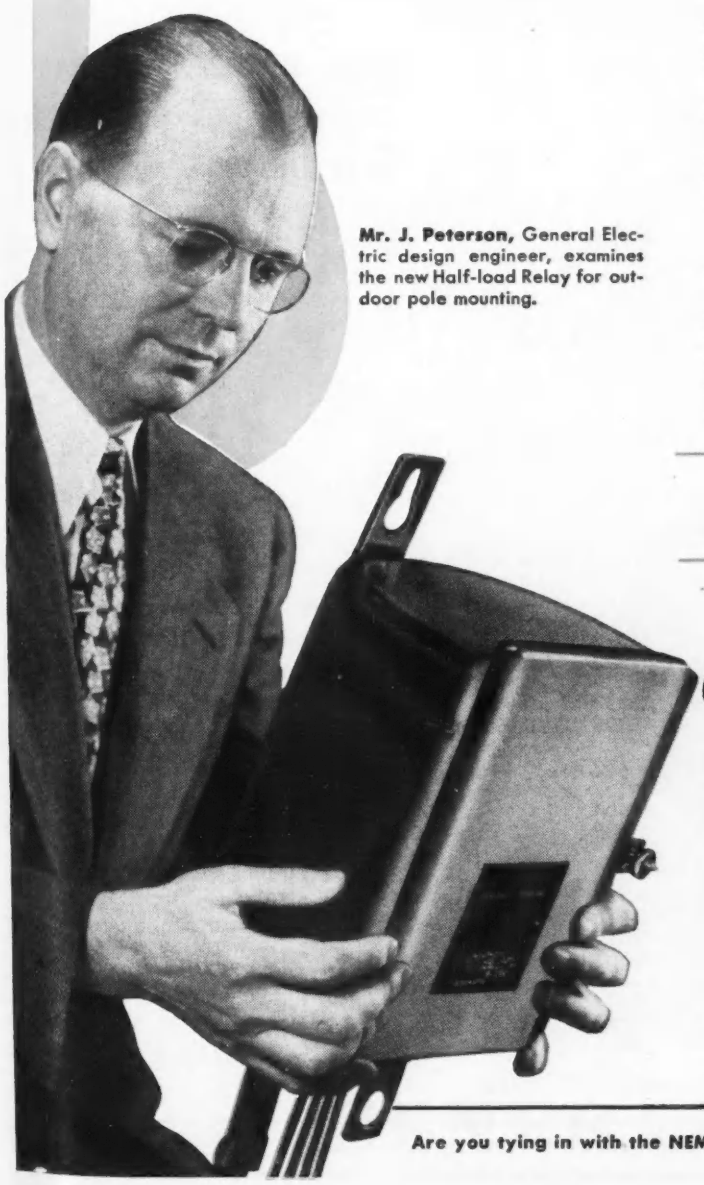
The relay accomplishes this cut in transformer requirements by starting only half of the lamps first, and then after they are burning, starting the second half. Relay operates in conjunction with a standard street-lighting controller with normally open contacts—connected across the series loop at about the half-way point

THIS IS THE WAY IT WORKS

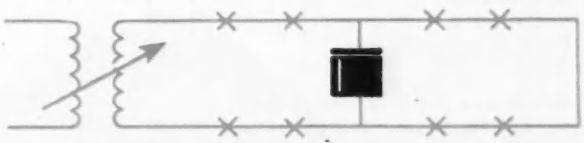
A few seconds after the series circuit is energized, the relay operates the controller, shorting out the second half of the circuit. With the reduced load, the lamps in the first half start, and the voltage across them drops to normal. The relay then opens the controller, and the remaining lamps start. The circuit is so arranged that the standard protector will detect an open in either half of the load loop.

CUTS DOWN TRANSFORMER COSTS

With the Half-load Relay, only warm-weather allowances need be figured for cold-weather starting—830 watts for the EH-1 and 625 watts for the CH-5 mercury lamps. Except in minimum-size installations, this means a saving in transformer costs.



Mr. J. Peterson, General Electric design engineer, examines the new Half-load Relay for outdoor pole mounting.



New relay and standard controller are connected across series mercury loop at about mid-point, to short circuit the far half of loop during starting.

GENERAL ELECTRIC

452-73

GOOD STREET LIGHTING BUILDS GOOD WILL

The new Half-load Relay is another of General Electric's developments that help you provide better street lighting at lower cost. For additional information call your Apparatus Office or write *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

Are you tying in with the NEMA plan to give America better street lighting?

Conductor Data

Weights and diameters of commonly used conductors, as compiled for overhead line construction listing by Detroit Edison Co

Copper Conductors

(Unless otherwise specified)

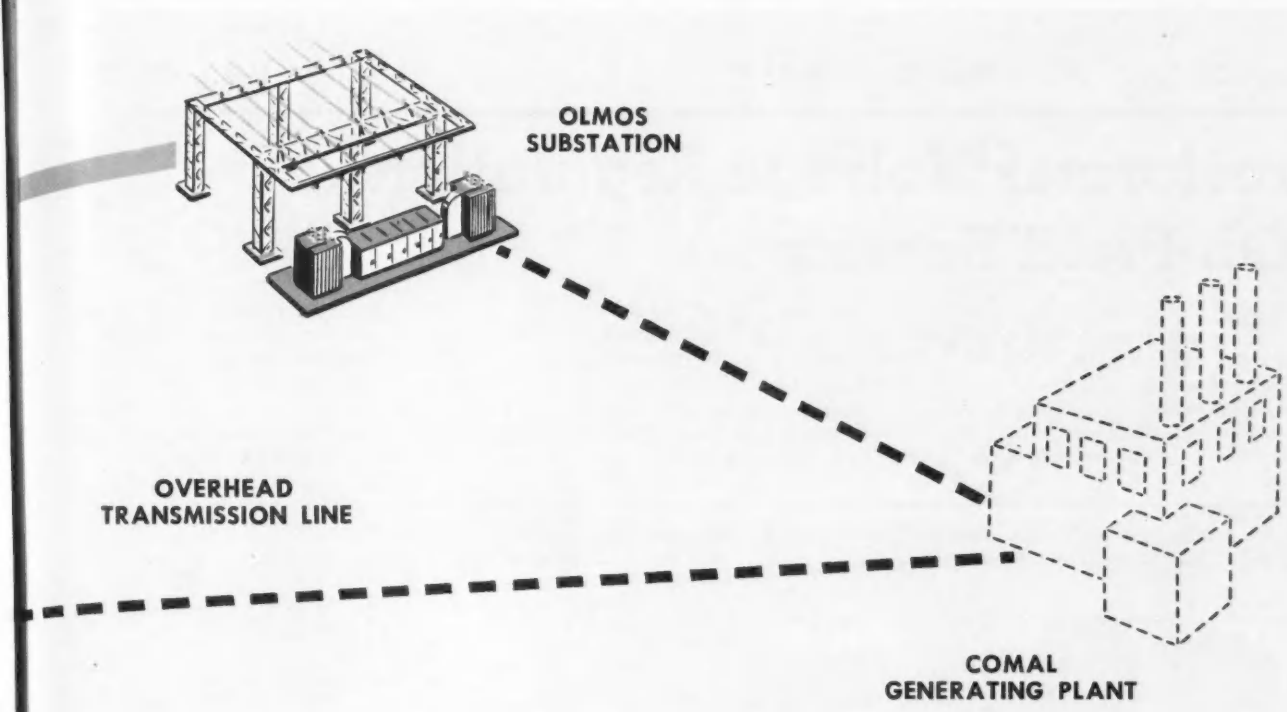
Conductor Size and Kind	Lb/ft	Ft/lb	Diameter, in. Cond.	Diameter, in. Overall
No. 8, b, h, solid	0.050	20.0	0.128	0.128
8, wp, h, solid	0.075	13.33	0.128	0.260
8, wp, s, solid	0.075	13.33	0.128	0.260
8, tree, h, solid, 3/64 in. ri	0.099	10.10	0.128	0.400
8, duplex, mh, str, 4/64 in. ri	0.186	5.4	0.145	0.60x0.35
No. 8A, CuW-copper, b, 3-str	0.074	13.5	0.199	0.199
No. 6, wp, h, solid	0.112	8.93	0.162	0.328
6, wp, s, solid	0.112	8.93	0.162	0.328
6, wpx, h, solid	0.13	7.7	0.162	0.343
No. 6, wpx, triplex, 2 No. 6 wpx, s, solid around 8C Copperweld	0.32	3.12	.....	.....
6, wpx, quadrex, 3 No. 6 wpx, s, solid around 8C Copperweld	0.45	2.22	.....	.....
No. 4, bare, h, solid	0.126	7.90	0.204	0.204
4, wp, s, solid	0.164	6.11	0.204	0.359
4, tree, h, solid, 4/32 in. ri	0.296	3.38	0.204	0.639
4, ACSR, b, 7-str	0.058	17.23	0.250	0.250
4A, CuW-copper, b, 3-str	0.162	6.2	0.290	0.290
No. 2, wp, h, solid	0.260	3.85	0.258	0.437
2, wp, s, solid	0.260	3.85	0.258	0.437
2, wpx, h, solid	0.280	3.60	0.258	0.438
2, tree, h, solid, 4/32 in. ri	0.358	2.80	0.258	0.688
2, 6/32 in. ri, S, 7-str	0.533	1.87	0.292	0.835
2, ACSR, b, 7-str	0.092	10.85	0.316	0.316
No. 2, wpx triplex, 2 No. 2 wpx, s, solid around No. 4 b, h, copper	0.686	1.46	.....	.....
2 wpx quadrex 3 No. 2 wpx, 2, solid around No. 4 b, h, copper	0.966	1.035	.....	.....
1/0, b, h, 7-str	0.326	3.05	0.373	0.373
1/0, wp, h, 7-str	0.424	2.36	0.373	0.605
1/0, wpx, h, 7-str	0.420	2.40	0.373	0.553
1/0, tree, h, 7-str, 4/32 in. ri	0.565	1.77	0.373	0.803
1/0, ACSR, b, 7-str	0.145	6.77	0.398	0.398
2/0, ACSR, b, 7-str	0.184	5.44	0.447	0.447
3/0, b, h, 7-str	0.518	1.93	0.464	0.464
3/0, ACSR, b, 7-str	0.231	4.33	0.502	0.502
4/0, b, h, 7-tr	0.653	1.53	0.522	0.522
4/0, wp, h, 19-str	0.800	1.25	0.522	0.785
4/0, wpx, h, 19-str	0.83	1.2	0.528	0.708
4/0, 6/32 in. ri, s, 19-str	1.102	0.910	0.522	1.060
4/0, ACSR, b, 7-str	0.292	3.42	0.563	0.563
250Mcm, b, h, 19-str	0.772	1.30	0.573	0.573
350Mcm, wp, s, 19-str	1.345	0.743	0.683	0.978
500Mcm, wp, s, 37-str	1.894	0.53	0.815	1.108
500Mcm, 5/64 in. Neoprene, 5/64 in. ri, 37-str	1.830	0.55	0.815	1.160

Steel Wire and Stramd

Item	Kind	Diam, in.	Lb/100 ft
3M str	Galv. steel	1/4	11.4
6M str	Galv. steel	5/16	22.5
10M str	Galv. steel	3/8	27.3
16M str	Galv. steel	7/16	39.9
5/16-in. CuW str	30% copper	5/16	20.5
3/8-in. CuW str	30% copper	3/8	32.2

Abbreviations Used in the Table

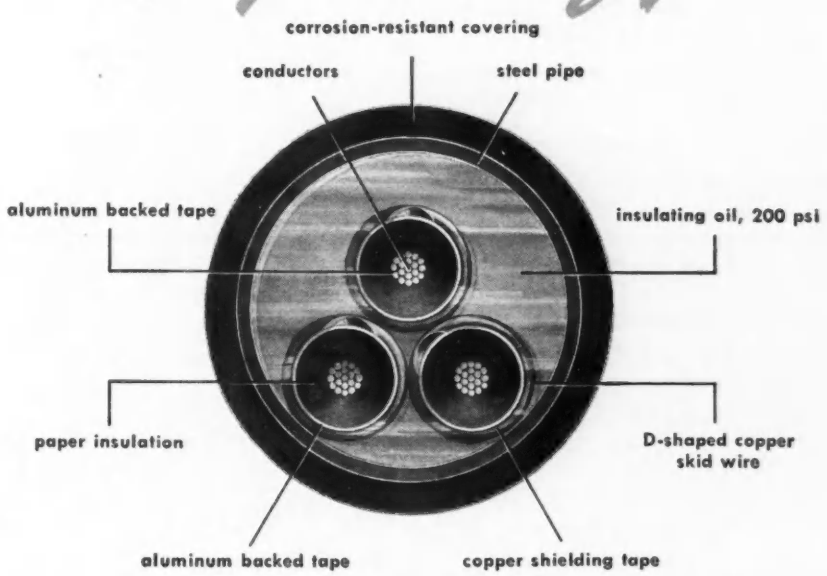
wp = triple braid weatherproof
wpx = improved weatherproof
ri = rubber insulated
str = strand
ACSR = aluminum cable steel reinforced
CuW = copperweld
b = bare
h = hard
mh = medium hard
s = soft



CABLE

Good Cable Engineering!

When you consider a high-pressure system, let G-E engineers save you money. These engineers are constantly devising new and better installation methods. They design and make the only complete line of high-voltage cable accessories; they are continuously pioneering basic advances in cable technology. They are ready to serve you. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*



This is the Cable!

GENERAL ELECTRIC

Transformer Voltage Regulation In Oil-Field Service

TABLES SHOW the percent voltage drop or regulation through a transformer bank due to starting a motor and for one motor running with and without capacitors.

These data are based on representative impedance values for transformers having primaries up to 15 kv and secondaries up to 600 volts, and for load and power factor corresponding to a fully loaded motor for oil-well pumping service. At reduced motor load, voltage regulation will be less, although the power factor is poorer.

These data are for one motor. If there are several motors in simultaneous operation, the voltage drop would be in direct proportion to the total horsepower rating.

The data apply for the transformer only. Voltage drops of the various parts of the distribution system can be determined independently and then added together, to give the overall percentage drop.

TABLE I—Approximate Percent Voltage Drop Through A Transformer Bank Due To Starting One Motor At Full Voltage([b])

Motor ([a]) hp	3-Phase Transformer Bank KVA																			
	4.5	9	10	15	22.5	25	30	37.5	45	50	75	100	112.5	150	200	225	300	450	500	600
3	12.7	6.4	5.7	3.8	2.5	2.3	1.9	1.5	1.3	1.1	0.8	....	....	....	....	....	....	....	....	....
5	....	9.7	8.8	5.9	3.9	3.5	2.9	2.3	2.0	1.8	1.3	1.0	0.8	....	....	....	....	....	....	....
7.5	....	13.9	12.5	8.4	5.6	5.0	4.2	3.3	2.8	2.5	1.8	1.3	1.2	0.9	....	....	....	....	....	....
10	....	....	16	10.7	7.5	6.4	5.4	4.3	3.6	3.2	2.3	1.7	1.5	1.1	1.0	0.9	....	....	....	....
15	....	....	....	15.8	10.5	9.4	7.9	6.3	5.3	4.7	3.4	2.5	2.2	1.7	1.5	1.3	1.0	....	....	....
20	....	....	....	....	13.7	12.3	10.3	8.2	6.9	6.2	4.4	3.3	2.9	2.2	1.9	1.7	1.3	1.9	....	....
25	....	....	....	....	....	16.2	13.6	10.8	9.0	8.1	5.9	4.5	4.0	3.0	2.6	2.3	1.7	1.2	1.0	0.9
30	....	....	....	....	....	....	16	12.8	10.7	9.6	7.0	5.3	4.7	3.5	3.1	2.7	2.1	1.4	1.2	1.0
40	....	....	....	....	....	....	....	....	14.2	12.8	9.5	7.1	6.3	4.8	4.1	3.7	2.8	1.8	1.7	1.4
50	....	....	....	....	....	....	....	....	....	15.6	11.7	8.8	7.8	5.8	5.1	4.5	3.4	2.3	2.0	1.7
60	....	....	....	....	....	....	....	....	....	....	13.9	10.4	9.3	7.0	6.0	5.4	4.1	2.7	2.4	2.0
75	....	....	....	....	....	....	....	....	....	....	17.5	12.9	11.5	8.6	7.5	6.7	5.0	3.3	3.0	2.5

TABLE II—Approximate Percent Voltage Drop Through A Transformer Bank For One Motor Running([c]) (Without Capacitors)

Motor([a]) hp	3-Phase Transformer Bank KVA																			
	4.5	9	10	15	22.5	25	30	37.5	45	50	75	100	112.5	150	200	225	300	450	500	600
	SECTION I										SECTION III				SECTION V					
3	2.0	1.0	0.9	0.6	0.4	0.35	0.3	0.25	0.2	0.2	....	....	....	....	....	....	....	....	....	....
5	...	1.5	1.4	0.9	0.6	0.55	0.45	0.35	0.3	0.28	0.18	....	....	....	....	....	....	....	....	....
7.5	...	2.3	2.0	1.4	0.9	0.8	0.7	0.55	0.45	0.4	0.25	0.2	0.18	....	....	....	....	....	....	....
10	...	...	2.7	1.8	1.2	1.1	0.9	0.7	0.6	0.55	0.35	0.25	0.23	0.18	....	....	....	....	....	....
15	...	...	...	...	1.8	1.6	1.4	1.1	0.9	0.8	0.5	0.4	0.35	0.25	0.23	0.2	....	....	....	....
20	...	...	...	...	2.4	2.2	1.8	1.4	1.2	1.1	0.7	0.5	0.5	0.35	0.3	0.25	0.2	0.13	....	....
	SECTION II										SECTION IV				SECTION VI					
25	...	...	...	...	...	2.3	1.9	1.5	1.3	1.1	0.7	0.5	0.45	0.35	0.28	0.25	0.18	0.13	....	....
30	...	...	...	...	...	....	2.3	1.6	1.5	1.4	0.8	0.6	0.55	0.4	0.35	0.3	0.23	0.15	....	....
40	...	...	...	...	...	....	....	....	2.0	1.8	1.1	0.8	0.7	0.55	0.45	0.4	0.3	0.2	....	....
50	...	...	...	...	...	....	....	....	....	2.3	1.4	1.0	0.9	0.7	0.55	0.5	0.35	0.25	0.23	0.18
60	...	...	...	...	...	....	....	....	....	....	1.6	1.2	1.1	0.8	0.7	0.6	0.45	0.3	0.28	0.23
75	...	...	...	...	...	....	....	....	....	....	2.0	1.5	1.4	1.0	0.8	0.8	0.55	0.35	0.35	0.28

TABLE III—Approximate Percent Voltage Drop Through a Transformer Bank For One Motor Running([d]) (Without Capacitors)

Motor([a]) hp	3-Phase Transformer Bank KVA																			
	4.5	9	10	15	22.5	25	30	37.5	45	50	75	100	112.5	150	200	225	300	450	500	600
3	1.3	0.7	0.6	0.4	0.45	0.25	0.2	0.15	0.13	0.13	....	....	....	....	....	....	....	....	....	....
5	...	1.0	0.9	0.6	0.4	0.35	0.3	0.25	0.2	0.18	0.1	....	....	....	....	....	....	....	....	....
7.5	...	1.5	1.3	0.9	0.6	0.55	0.45	0.35	0.3	0.25	0.15	0.1	0.1	....	....	....	....	....	....	....
10	...	...	1.8	1.2	0.8	0.7	0.6	0.45	0.4	0.35	0.18	0.15	0.13	0.1	....	....	....	....	....	....
15	...	...	...	...	1.2	1.0	0.9	0.7	0.6	0.55	0.3	0.2	0.2	0.15	0.13	0.1	....	....	....	....
20	...	...	...	...	2.6	1.4	1.2	0.9	0.8	0.7	0.4	0.3	0.25	0.2	0.15	0.15	0.1	0.07	....	....
25	...	...	...	...	....	1.7	1.5	1.2	1.0	0.9	0.45	0.35	0.3	0.23	0.2	0.15	0.13	0.08	....	....
30	...	...	...	...	....	....	1.7	1.2	1.2	1.0	0.55	0.4	0.35	0.28	0.2	0.2	0.15	0.1	....	....
40	...	...	...	...	....	....	....	....	1.5	1.4	0.7	0.55	0.5	0.35	0.3	0.25	0.2	0.13	....	....
50	...	...	...	...	....	....	....	....	....	1.7	0.9	0.7	0.6	0.45	0.35	0.3	0.25	0.15	0.15	0.13
60	...	...	...	...	....	....	....	....	....	....	1.1	0.8	0.7	0.55	0.45	0.4	0.3	0.2	0.18	0.15
75	...	...	...	...	....	....	....	....	....	....	1.4	1.0	.9	0.7	0.55	0.5	0.35	0.25	0.23	0.18

Motor([a])

Notes for the three tables.

([a]) Motors up to 20 hp are high-starting-torque type. Motors above 20 hp are normal-starting-torque type.

([b]) Voltage drop with capacitors connected to motor, approximately 95 percent of values in table.

([c]) Table II is based on 1200-rpm motors. Following multipliers are to be used for other motor speeds.

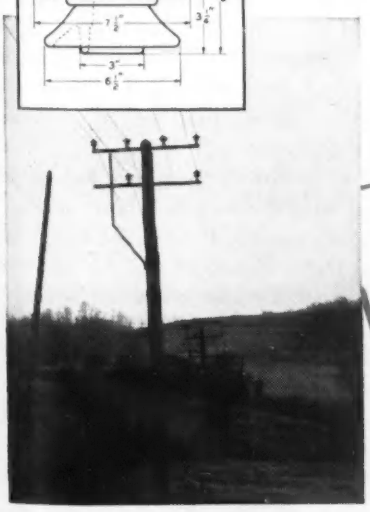
Motor rpm	Sections I, III, and V	Sections II, IV, and VI
900	1.2	1.1
1800	0.9	1.0

([d]) Table based on approximately 97.5 percent power factor. Data supplies to 900, 1200, and 1800-rpm motors.

Tables are adapted from an application manual prepared by General Electric Co, Schenectady, N. Y.

Life can be Glorious with O-B PINTYPES

● Morning Soap Operas may not be *your* favorite dish but, to millions of housewives these morsels of romance are a serious business--nothing to be spoiled by the interference of a near-by noisy power line. A real factor in good public relations exists here . . . For the entire voltage range of distribution circuits, O-B can furnish radio-quiet insulators. Lines so insulated can be rendered interference-free. You won't spend time on the telephone trying to calm down irate Soap Opera fans, or you won't be sending noise-detection crews out on your lines; to be followed by a hoped-for satisfactory repair. . . O-B radio-proof Silentypes can save you a lot of headaches, plus a lot of real line maintenance money. Use them on your low-voltage distribution circuits, then *your* "Life Can Be Glorious"!



O-B PINTYPE WITH SILENTYPE GLAZE
NO. 38 246
Nominal Rating, 23 kv.

Lower-voltage radio-proof insulators may not have found their way into your company Purchasing Standards. It will pay you to check these while you think of it.

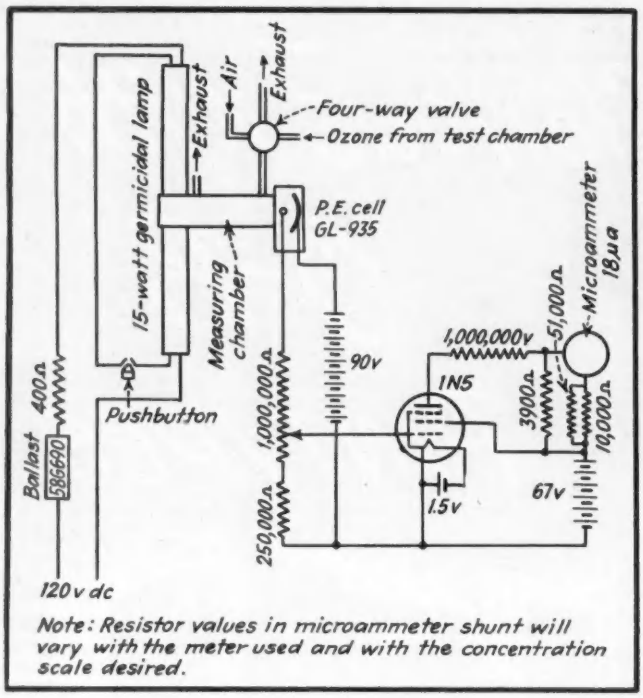
. . . . AND FOR DURABILITY
These O-B pintypes have seen 33 years of service on an Eastern system, and may see many more.

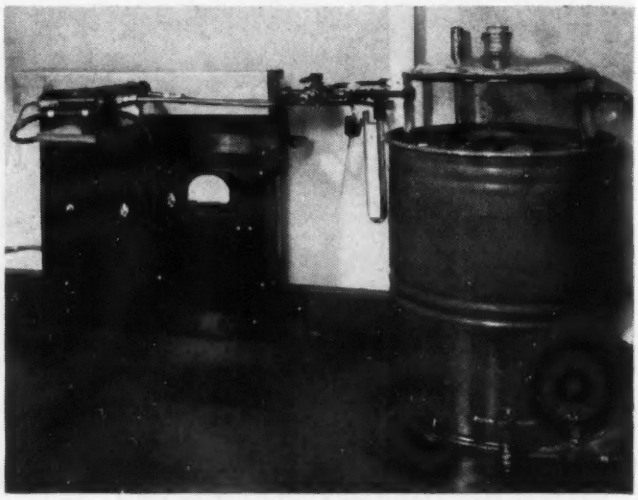
2661-H

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd.,
Niagara Falls, Ontario





SCHEMATIC DIAGRAM (left) of method of measuring ozone concentration. Ozone test chamber and electronic ozonometer are shown above. The Boston Edison Co has been using this device for about a year and has found it very reliable and consistent. Frequent checks on the equipment show no change from the original calibration.

Evaluating Ozone By Electronic Means

W. H. MEADE
Boston Edison Company
Boston, Mass.

IN TESTING new and used rubber-covered cables for ozone resistance, the Boston Edison Co has adopted a procedure similar to one used by Dr. L. R. Koller (*General Electric Review*, April, 1946). Dr. Koller was determining the amount of ozone produced by low-pressure mercury lamps. He measured the ozone concentration by an optical method based on the absorption of 2,537 A (angstrom) radiation by ozone. He employed a germicidal lamp and an FJ-405 phototube. The concentration was calculated from the photo current by Beer's Law. With a 6-in. light path concentrations between 10 and 700 ppm (parts per million) could easily be measured.

The results obtained were in good agreement with those given by the standard chemical method of bubbling gas through KI solution and titrating with sodium thiosulphate. While oxides of nitrogen may be formed under these conditions, their absorption for 2,537 A radiation is neglibly small compared to that for ozone.

The Boston utility's adapation of this method consists fundamentally of an ultraviolet source, a measuring chamber, a photoelectric cell, an amplifying unit and an indicating microammeter. In the diagram (above) ozone from the test chamber which has a pressure slightly above atmospheric flows to a 4-way valve. This is arranged so that the ozone may be passed to the measuring chamber or exhausted to the outside air. If a concentration measurement is desired, the ozone is led from the test chamber (where the cable section or other sample is exposed to this gas) into the measuring chamber.

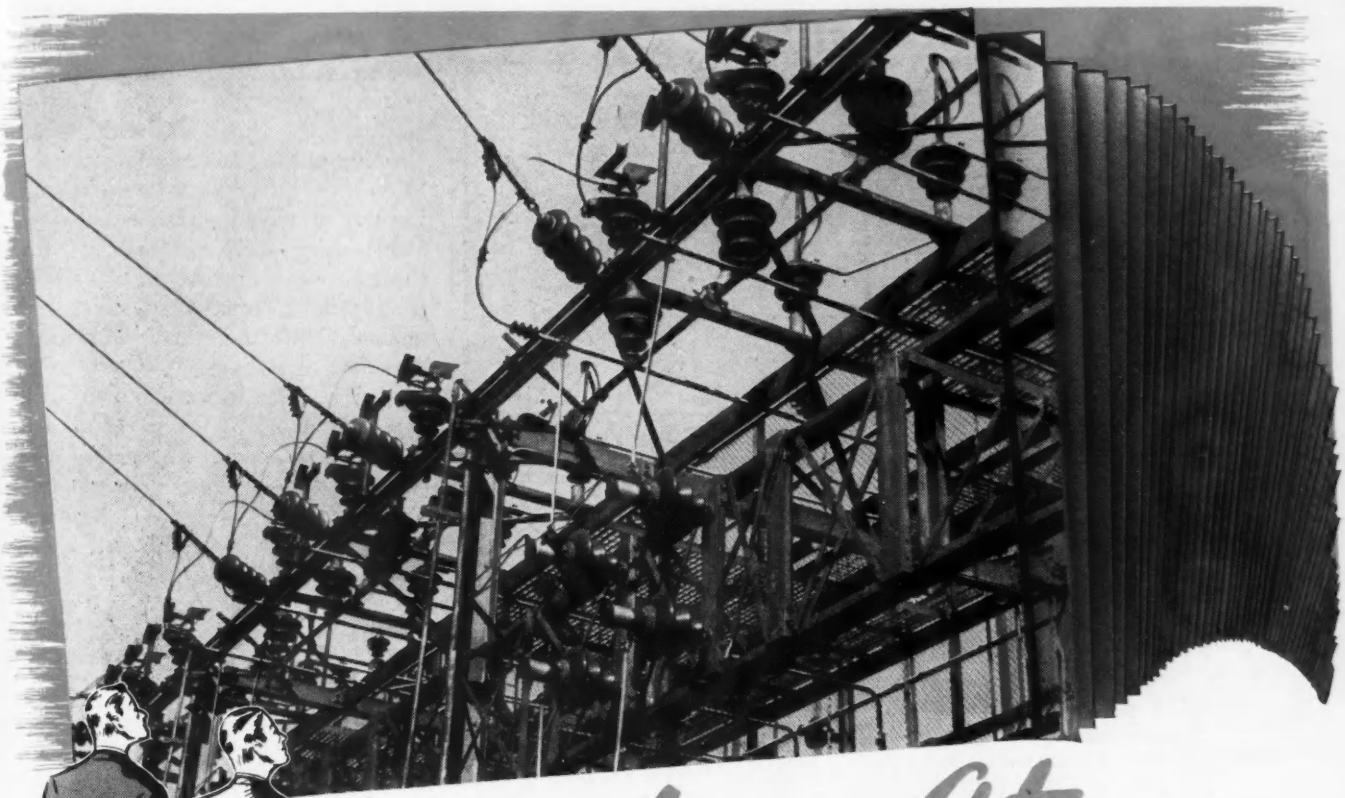
Cable Classification

Cables are classified as ozone-resisting or otherwise by subjecting them to an atmosphere containing 0.01% of O_3 for 3 hr. As the ozone passes into the measuring chamber and is distributed, radiation from the germicidal lamp passes through it. The amount of radiation which penetrates through the atmosphere in the measuring chamber and affects the photocell depends on the ozone concentration. The current produced in the photocell by this radiation is amplified sufficiently to register on the microammeter.

This device can be used to furnish either continuous or periodic indications of ozone concentration in the test chamber. If the latter type of measurement is being made, it is desirable to flush the measuring chamber of all atmosphere remaining from the previous measurement. This is done by introducing compressed air into the measuring chamber through the 4-way valve, and exhausting it to the outside air. A few seconds of flushing in this way completely purges the chamber.

In calibrating the microammeter to read in "percent ozone," it was found that good agreement could not be obtained between concentration as calculated by Beer's Law, and as determined by chemical methods. The microammeter was finally calibrated, however, by means of numerous chemical determinations at various concentrations.

The Boston Edison Co has been using this device for about a year and has found it very reliable and consistent. Frequent checks on the equipment by the chemical method show no change from the original calibration. The device measures ozone concentration in a test chamber without upsetting the chamber equilibrium. The measurement is obtained on the normal discharge of the chamber, whereas the chemical method involves draining 500 milliliters of gas from the chamber, temporarily upsetting the conditions.



Looking At
10,000 TOMORROWS

Knowing what you have in a station insulator, today, is easy. Standards guide every phase of manufacture. But you can't measure or specify tomorrow's performance until tomorrow arrives!

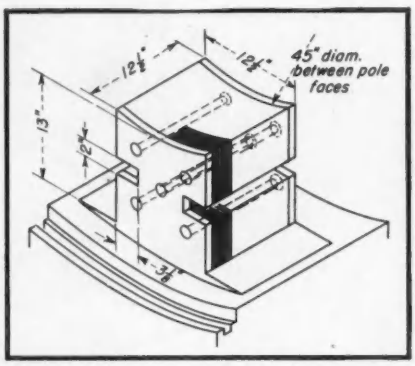
You can predict it reliably, however, by checking the record of countless O-B insulators with well over 10,000 "tomorrows" on their shoulders. These 30-year-old units are still sound because they were basically sound to start with. This fundamental quality of O-B station insulators is no accident. It is being repeated every day, and will repeat on your own system when you insulate your stations with O-B.

Ohio Brass

MANSFIELD OHIO

CANADIAN OHIO BRASS CO., LIMITED, NIAGARA FALLS, ONTARIO

2869-H



POLE CORE and section of yoke (above) after notching. Flame (left) completes a cut for a notch in generator pole. No welding of laminations occurred and slight cleaning of the notches was necessary to remove scale

Flame Cutting Notches Laminated Poles

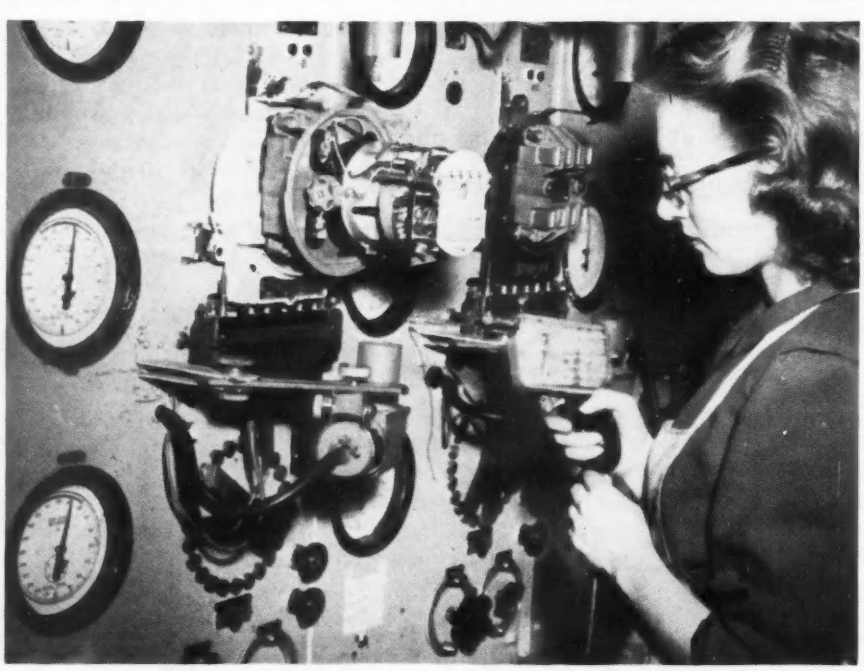
H. E. MURPHY
Project Engineer
Stone & Webster Engineering Corp
Los Angeles, Calif.

IN CONNECTION with the change of frequency from 50 to 60 cycles on the Southern California Edison Co System, the speed was increased on three motor-generators, each d-c generator having 8 poles and rated 400 kw, 600 v. The speed-up required an alteration of the magnetic structure of the d-c machines which could best be accomplished by pole notching.

The pole pieces were cast in place in the frame and therefore could not be removed for machining. To machine cut the notches would be extremely difficult if not impossible as a field job and to transport the frame to a machine shop would be difficult and expensive. A decision was made to notch the pole pieces by cutting with an oxyacetylene flame. Pole piece construction, notch dimensions, and flame cutting operation on a pole are shown by the accompanying illustrations.

The notches were cut to acceptable limits of accuracy. No welding of laminations occurred and slight cleaning of the notches was necessary to remove scale. Then the field coils were reassembled and the machines returned to service within a very short time as compared to that which would have resulted from other methods which might have been used. The cost of the operation was relatively low. Time for cutting one notch varied from 2½ to 3 min which did not include make-ready time. The complete cutting operation on the three machines required approximately 36 man-hours, not including tearing down and assembly of the machines.

Operation of the machines after the notch cutting was completed was in accord with the calculations. Thus establishing the fact that the cutting operation did not alter the magnetic properties of the steel to any appreciable extent.



QUICK CHANGES in the lag adjustment of Westinghouse single-phase watthour meters are made with a "hot-wire" soldering gun at the Hazelton meter shop of the Pennsylvania Power & Light Co. The gun, which operates on 115 volts, makes it possible for an unskilled girl to make the adjustment without removing the meter from the automatic test board.

Salvaging Used Cable—1*

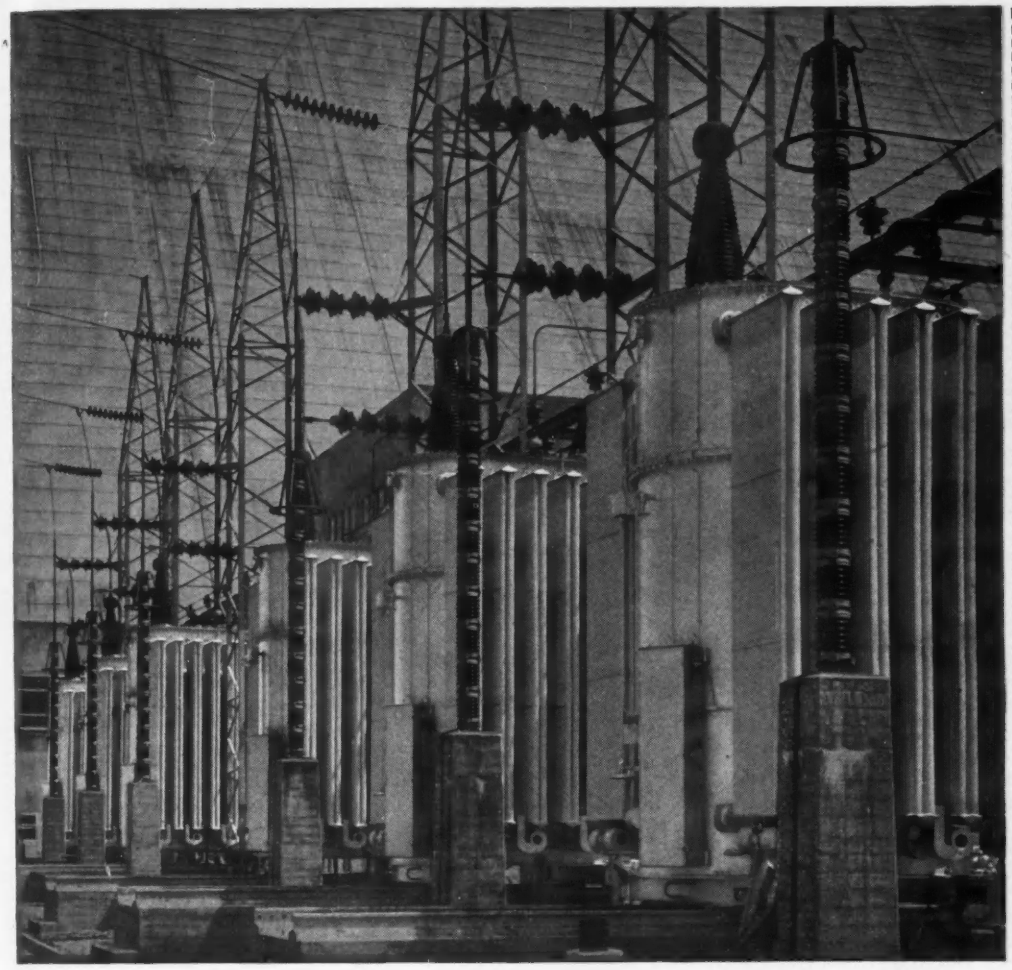
W. H. MEADE
Technical Standards and Test Section
Boston Edison Co.

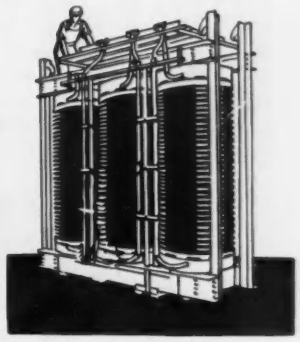
TEN YEARS' EXPERIENCE in cable salvage has reclaimed 333,000 ft for Boston Edison service out of 370,000 ft processed. Of that amount, 250,000 ft was approved for re-use at original voltage rating. Voltage derating was applied to 83,000 ft. The balance was junked. Cable salvage greatly assists the company's stock control of inventories, and was of considerable value during the recent war.

Cable removed from the system goes to the company's Technical Standards and Test Section. If a length has failed, the fault is located, cut out and tagged. The dissecting quarters of the Transmission and Distribution Department then analyze it to determine cause of failure. Each month three engineers specially trained in such work investigate the accumulations.

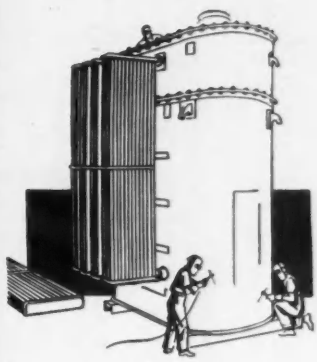
Physical data such as length, voltage and conductor size, are then submitted to the Stores Section. Decision is here reached as to the suitability

* First installment of a five-part serial on Boston Edison Co practice.

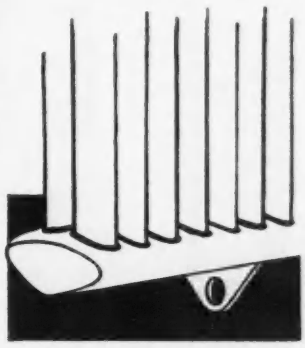




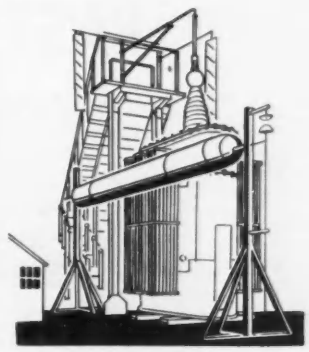
Core and Coil Construction



Tank Construction



Radiator Construction



Transformer Testing

MOLONEY FEATURES SAVE YOU MONEY!

The features that are built into every Moloney Power Transformer are the result of years of exhaustive study and research. Research that is based on records of results actually obtained . . . on more efficient operating performance and lower maintenance costs.

Take, for instance, Core and Coil Construction. Core type construction is used, providing a maximum amount of winding surface exposed to the oil to assure efficient dissipation of heat. To insure the greatest possible protection against distortion under the most severe operating conditions, windings are rigidly braced.

Tanks are made of high grade steel, electrically welded, with Z bars or box-type reinforcements . . . Radiators are of all-welded construction with tubes spaced in a double row for easy cleaning and painting. There is no "hard-to-get-at" center row. All welds are external. Headers are designed so that water cannot collect and cause rust.

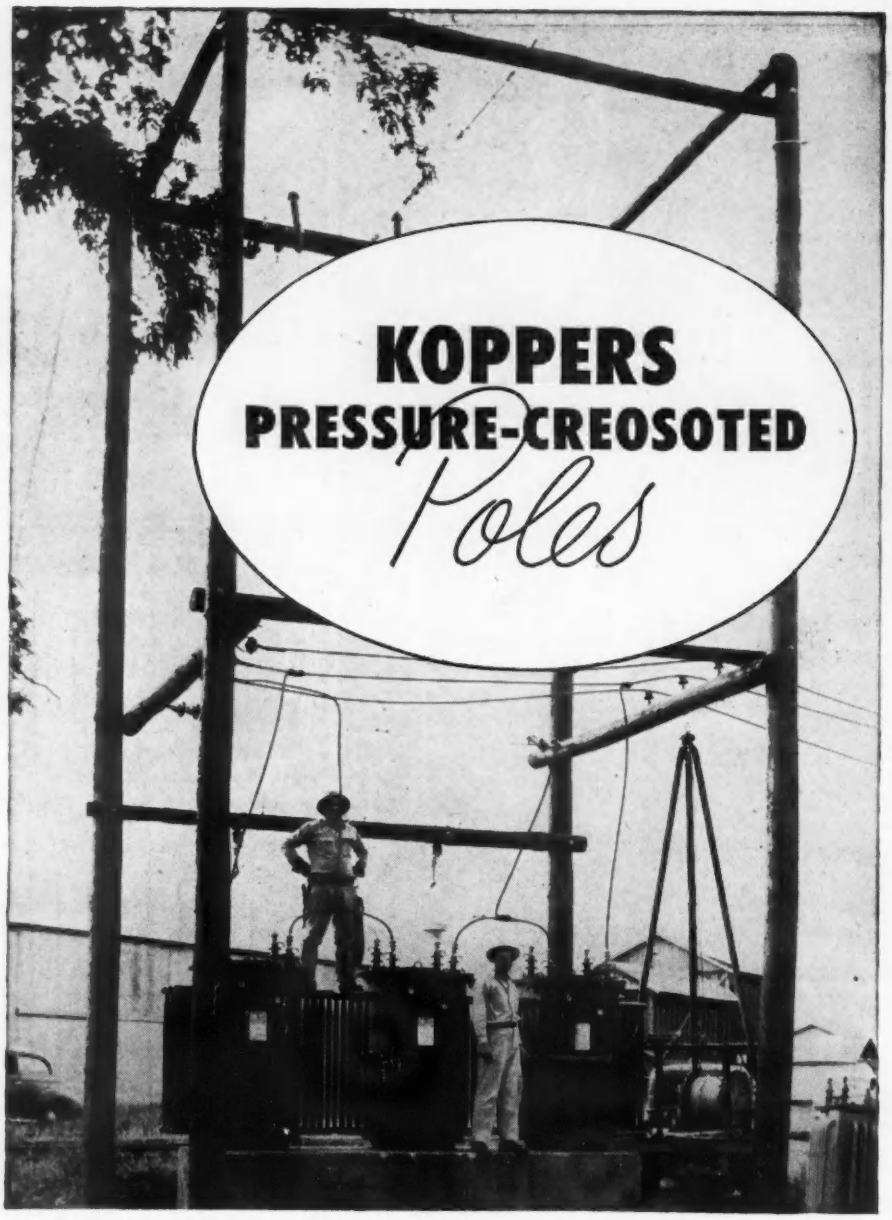
These and other features, all tested to meet the most rigid specifications for "on-the-job" performance, have been developed and improved in more than half a century of exclusive transformer manufacturing and are your assurance of *savings in dollars* . . . when you use Moloney Power Transformers.

Illustration above shows a Moloney Power Transformer installation: 168,000 Kva of installed capacity, transforming 13,800 to 161,000 volts.

. . . OVER 50 YEARS OF LEADERSHIP IN DESIGN, RESEARCH, ENGINEERING

MOLONEY ELECTRIC CO. ☆ ST. LOUIS 20, MO.

POWER AND DISTRIBUTION TRANSFORMERS EXCLUSIVELY SINCE 1896



PAST PERFORMANCE

is YOUR *best yardstick*

There's no margin for error or experiment in Utility pole installations. Dependability is *always* a "must."

Koppers Pressure-creosoted Poles, backed by long experience in the manufacture and processing of forest products . . . by constant and intelligent research . . . and by a record for long life and low costs, have a history that certifies their performance.

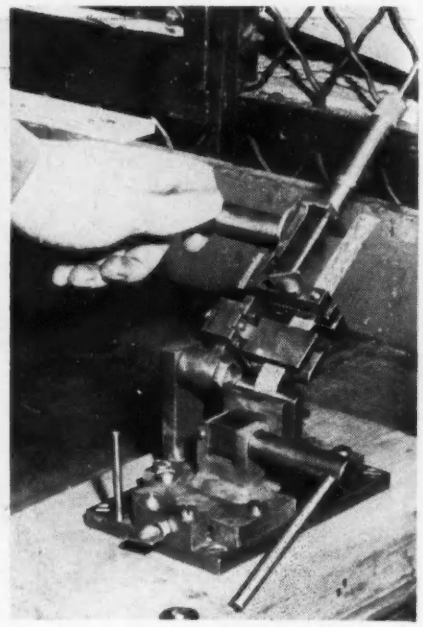
Prompt deliveries are assured from conveniently located treating plants. Ample facilities permit stocking of all needed quantities and sizes for contract treatment or out-of-stock shipments.

KOPPERS

PRESSURE-TREATED WOOD

KOPPERS COMPANY, INC.

PITTSBURGH 19, PA.



TESTING LEAD STRIP in IPCEA bending machine for defects in original construction

for re-use. Governing factors are age, length, amount in stock, frequency of use, etc.

The most common types of cable insulation used by the company are impregnated paper and various rubber compounds, mainly lead-sheathed. A small amount of varnished cambric and non-leaded rubber cable is used extensively on all underground transmission and on many distribution circuits (5 kv and above).

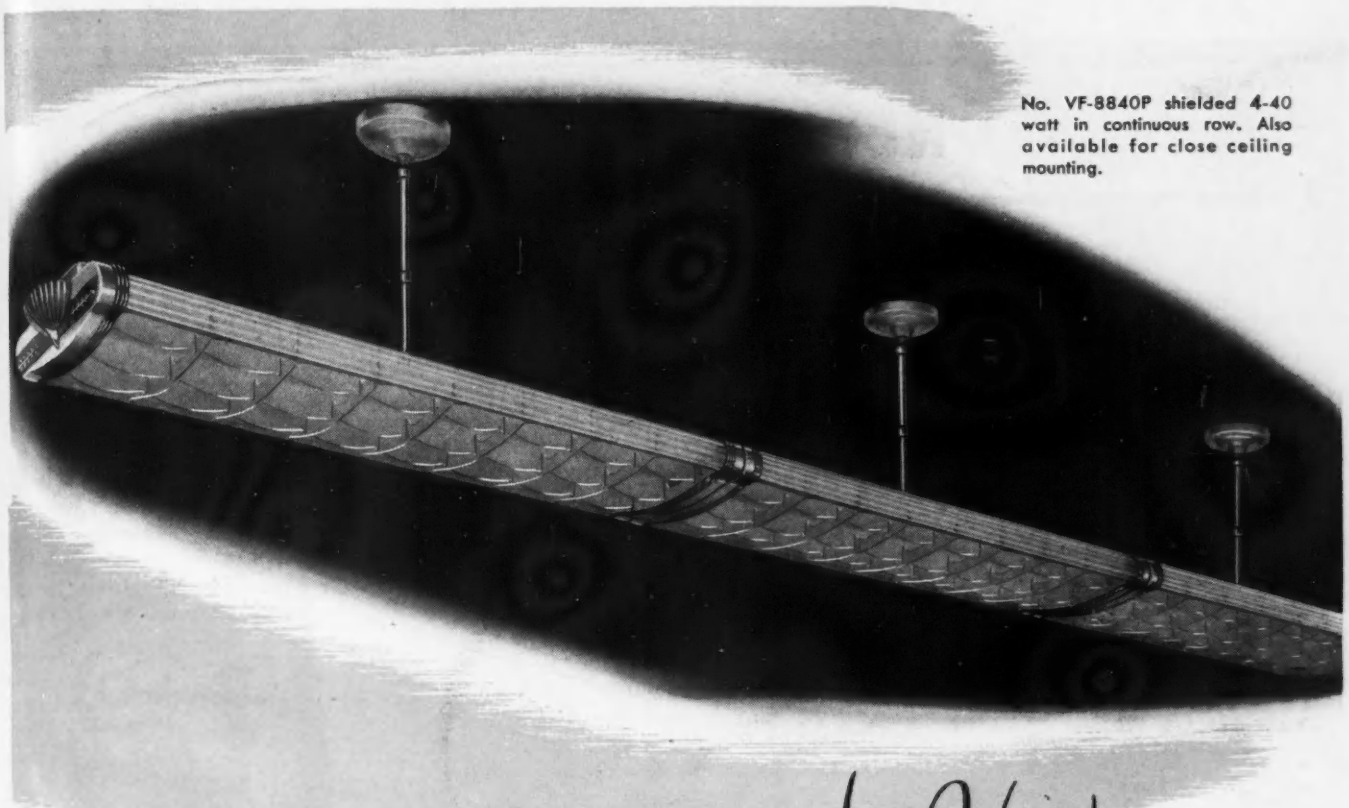
Salvage Procedure

First step in salvaging is a visual examination of the lead sheath. These cables are submitted to the salvage section on reels, so that at best, only a small portion of sheath can be inspected. This is further complicated by the presence of dirt and grease.

A ring of lead sheath is removed from each cable end for testing in the IPCEA bending machine. This reveals defects in original construction, such as poor welds, dross, laminations, etc.

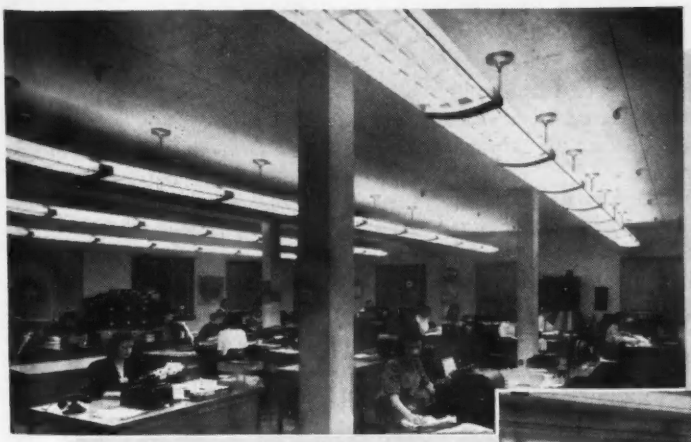
Minor defects brought out by this particular test are ignored. This is because the cable has already had a severe test in its installation and removal. Such treatment, if no previous defects became apparent, is unlikely to affect the useful future life of the salvaged cable.

Other steps include testing for moisture of unwrapped insulating paper and also for power factor. These will be outlined in a subsequent article.



No. VF-8840P shielded 4-40 watt in continuous row. Also available for close ceiling mounting.

COMMERCIAL FLUORESCENT *by Virden*



for Continuous Lines of Light

you'll like this fluorescent unit by Virden. Smart style. Crisp, clean lines. Pleasing use of modern plastics. Outstanding performance. High efficiency. Easy to install. Priced for extra value . . . thanks to Virden skill in mass production. Supplied exclusively through your Virden jobber. Let his friendly service help you.

Smooth soft light well distributed for planned lighting . . . by Virden.

See how long lines of fluorescent by Virden can provide a ceiling of light.

VIRDEN VALUE

John C. Virden Company • Cleveland, Ohio

Member American Home Lighting Institute

NEW EQUIPMENT

Pole Climbers

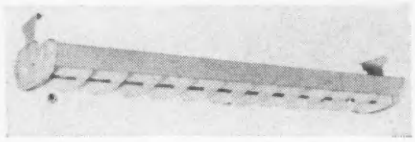
ADJUSTABLE pole climbers are being introduced by Buckingham Mfg Co, Inc, Binghamton, N. Y. The extension shank or leg iron can be set any desired length between 15 and 18.5 in. Top strap assembly is joined to the lower portion of the leg iron by two rods fitting into telescopic sockets. Set screws in each socket clamp the movable upper part in place.

Replaceable gaff construction is included. The gaff ends in a lug that fits tightly into a hub on the shank, being fastened in place by a "Driv Lok" pin through the gaff base and the hub. This pin, it is said, can be removed only by means of a hammer and punch. Angle of the gaff is reported to permit the lineman to stand closer to his work.

•

Fluorescent Luminaire

A TWO-LAMP unit type CD-80 to harmonize with both modern and conventional architectural interior treatments is announced by Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa. Available as a direct-indirect type with steel louvered bottom or as a semi-indirect type with a translucent plastic bottom, the fixture is well shielded and provides maximum diffusion with low brightness. Where maximum diffusion and shielding are required for critical and prolonged seeking tasks, the translucent bottom is recommended.



The plastic side and bottom panels are polystyrene extrusions. Two positive acting lock springs at the ends of the luminaire can be released by finger action to permit easy removal of the plastic.

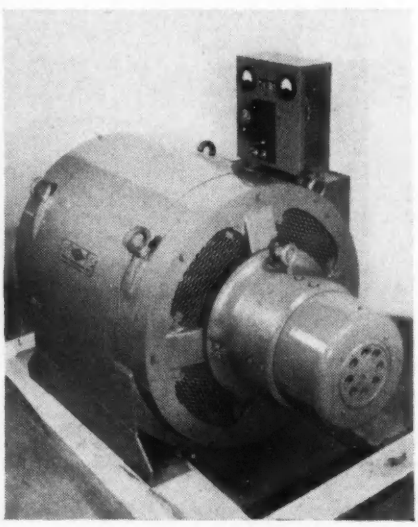
Single and twin stem hangers are available for suspension mounting. Louvered units can be mounted on ceiling brackets when required. Starters and ballasts are accessible without removing the lamps.

•

Alternators

ALTERNATORS in 187 kva size, 1800 rpm, with direct-connected exciter are available from Kato Engineering Co. Mankata, Minn. Frames are welded steel. Endbells are ribbed cast iron. Fan of aluminum blades riveted to a steel disk center provides cooling air through both stator and rotor.

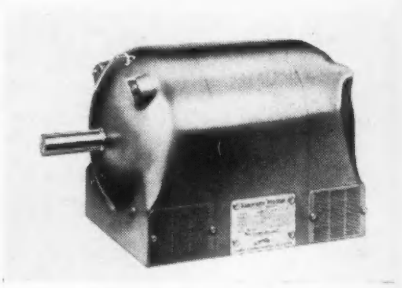
Separate switchboard is not needed. At least 10 to 12 lead wires are brought to a steel cabinet located on the side of the generator. This facilitates making following connections: 10 wire—1 cir. star, 2 cir. star; 12 wires—1 cir. star, 2 cir. star, 1 cir. delta, 2 cir. delta. Voltage regulator, voltmeter and ammeter are in a case mounted on top.



Sanitary Motor

FOR USE in dairies, food process, canning and beverage plants, a sanitary motor has been developed by the Louis Allis Co, Milwaukee 7, Wis. The motor is streamlined and reported to be free of cracks, recesses or depressions where milk or food products can collect.

Smaller ratings will be supplied in the totally enclosed, non-ventilated construction. Larger ratings are splash-proof and will be supplied with removable stainless steel grille plates over the cooling air inlets and outlets, making it vermin-proof. All sizes can be washed down.



Entire base is enclosed by the motor housing. Mounting bolt holes are located in accordance with NEMA standards, access is through the grille plates. Conduit box is built in. Additional information is given in Bulletin 711.

•

Panelboard

A NEW CIRCUIT breaker "plug-in" panelboard manufactured by Square D Co, 6060 Rivard St, Detroit 11, Mich, incorporates a branch-circuit terminal marking system. The 3-phase, 4-wire arrangement of the NMO panelboard eliminates doubt as to phase identification of branch circuits. Letters A, B and C are marked opposite each branch-circuit load terminal connected to the corresponding three phases.

Two-pole, 208-v circuits can be obtained in addition to single or two-pole, 120-v circuits, by connecting to adjacent A and B terminals.

Breaker units are thermal-magnetic trip type. Low heating is said to be achieved by high silver content in breaker unit contacts and elimination of bolted connections.

7 POINTS OF SUPERIORITY

HUB·RAK

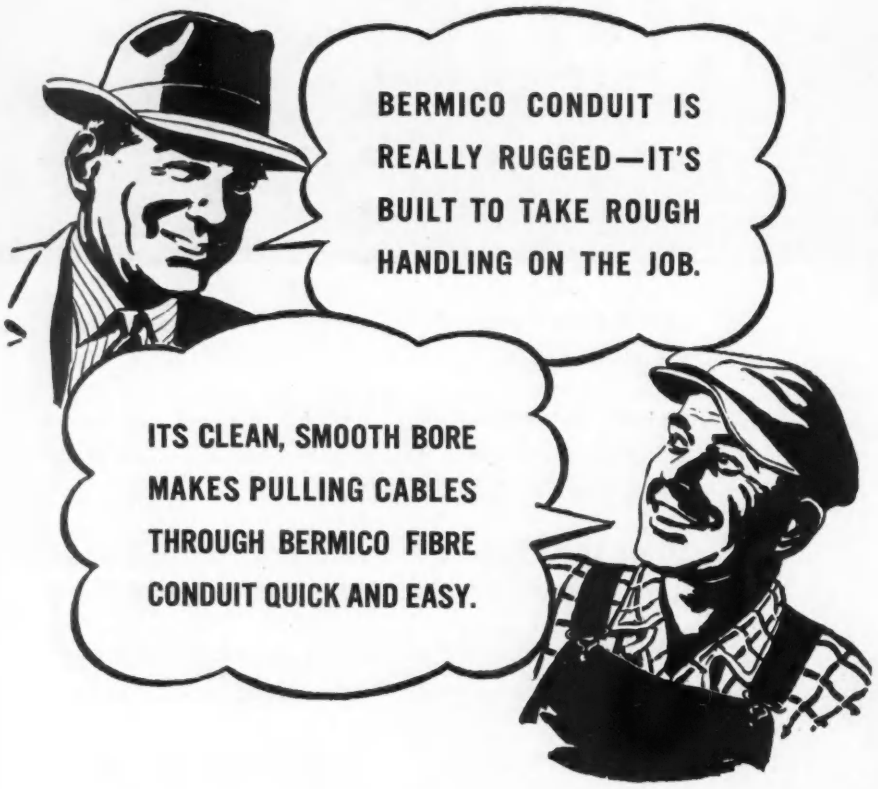
THE PRIMARY RACK FOR SECONDARY SERVICES

- **EXPERIENCE**—Hub-raks are backed by the manufacturing experience of 105 years in the durable goods field.
- **LABOR SAVING**—Perfect alignment of points . . . mount back-to-back, on same through bolts, line or service types. Easy insulator replacement.
- **LONG LIFE**—Hubbard double dip hot galvanizing assures a rust-resistant rack that will outlast your lines. Complete drainage.
- **STRENGTH**—Forged steel points rigidly attached through back to form a single, integral unit . . . broad backs . . . periodic check tests.
- **UTILITY**—Standard sizes and spacings . . . extended and non-extended backs . . . styles for heavy and light work.
- **EFFICIENCY**—All sizes . . . complete line of accessories . . . bolt or lag mounting . . . back-to-back mounting on same bolts.
- **DISTRIBUTION**—Stocks in all principal cities of the United States.

HUBBARD AND COMPANY

PITTSBURGH, PENNA. CHICAGO, ILL. OAKLAND, CALIF.

BERMICO* FIBRE CONDUIT


BERMICO CONDUIT IS REALLY RUGGED—IT'S BUILT TO TAKE ROUGH HANDLING ON THE JOB.
ITS CLEAN, SMOOTH BORE MAKES PULLING CABLES THROUGH BERMICO FIBRE CONDUIT QUICK AND EASY.

distributed by
WESTINGHOUSE ELECTRIC SUPPLY COMPANY
Offices in all leading cities

*®

BERMICO FIBRE CONDUIT—A PRODUCT OF BROWN COMPANY

Splice Vulcanizers

ANNOUNCEMENT IS made by the Shaler Co, Waupun, Wis, of its latest cable and belt splice vulcanizers. Model A is for repairs up to 8-in. long cable, ¼ to 2½-in. OD Model CV, illustrated, is to accommodate repairs up to 1 ft long and to 3½-in. diameter.

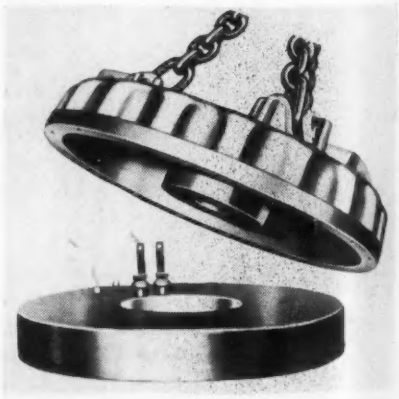
The vulcanizers consist of two stand-

ard heating plates provided with automatic temperature control and a built-in thermostat to hold the vulcanizing temperature to 285 F. Aluminum heating blocks hold the cables or rubberized fabric belts during the repair period.

Lifting Magnet

NEW TYPE CONSTRUCTION of this magnet, announced by Cutler-Hammer, Inc, 235 N. 12th St, Milwaukee 1, Wis., incases the coil in an all metal, welded capsule from which all moisture is removed prior to impregnating the coil with insulating compound under pressure. This seals the coil winding against the entrance of moisture.

Should the magnet become damaged, the capsule coil can be removed and a replacement coil inserted. The damaged coil which has been removed can then be sent to the factory for reinsulating. This feature is available in the 45, 55, and 65-in. magnet sizes. Removable pole shoes are also a feature of this new construction.



FLUORESCENT LAMPS
fluorescent lighting!

2. New G-E "Warm Tint"

A FLUORESCENT WITH THE WARMTH OF INCANDESCENT LIGHTING—A "NATURAL" FOR STORES AND HOMES!

The lamp that thousands of stores and home owners have been asking for—a fluorescent with the warmth of incandescent light and the high efficiency of the world's newest, most modern form of lighting!

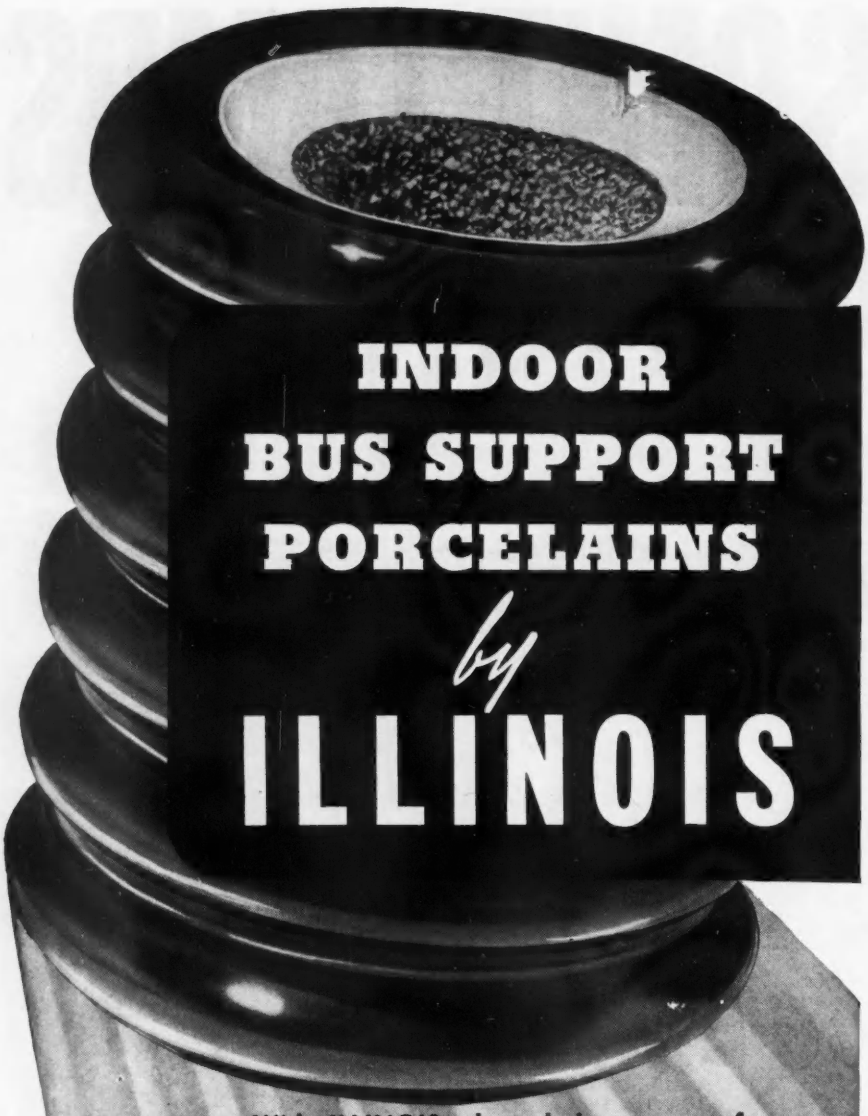
It's a rich, warm light that makes many types of merchandise, including draperies and dress materials, look their best—adds sales appeal to merchandise in stores and creates the friendly, intimate atmosphere that so many people want. Blends perfectly with existing incandescent lights.

THESE TWO THRILLING NEW G-E colors will stimulate a greater use of fluorescent lighting and bring higher lighting levels to more and more of your customers.

WE'RE TELLING YOUR CUSTOMERS all about the big news from G-E, through national and business magazine advertising and on our radio program, "What's My Name?" The result will be greater lighting consciousness everywhere—greater profits for you.

G-E LAMPS

GENERAL ELECTRIC



INDOOR
BUS SUPPORT
PORCELAINS
by
ILLINOIS

With ILLINOIS, the whole process of manufacturing electrical porcelain is characterized by extreme care, not only in controlling the chemical composition of ingredients, but the particle size, moisture content, and the drying and firing temperature.

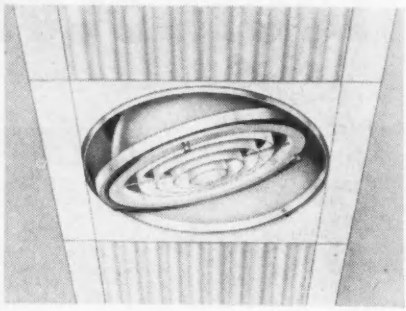
As a result of production control and serious attention to every fine detail, the purchaser of Illinois Indoor Bus Support Porcelains is assured of the following qualities in every order, large or small, regardless of sizes.

Complete Uniformity • Exact Dimensions
High Dielectric Strength • High Mechanical Strength

ILLINOIS
ELECTRIC PORCELAIN CO.
MACOMB • ILLINOIS

Troffer Downlight

FOR USE where a concentrated light is desirable, a recessed troffer downlight has been developed by Pittsburgh Reflector Co, Oliver Bldg, Pittsburgh 22, Pa. The unit is designed for individual, end, corner, cross-over and in-line mounting with standard width fluorescent troffers, and may be installed in



accoustical and other type of ceilings.

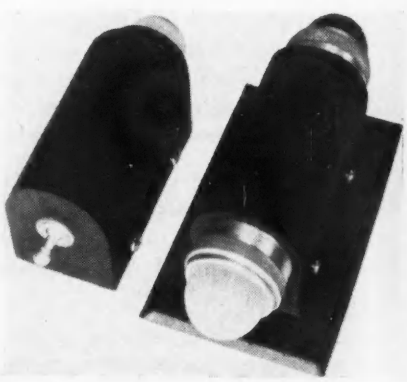
The downlight utilizes a silvered-glass Permaflector and a standard 200-w incandescent lamp. It is adjustable in a circle up to a 35-deg angle. Lamp shielding is accomplished with concentric louvers. Housing is 12 in. square by 10 in. deep.

•

Indicating Lamps

A SURFACE TYPE indicating light has been developed by H. R. Kirkland Co, Morristown, N. J. The new Q1 device consists of a die-cast base with a metal shell or cover which is held to the base by four screws. A knockout is provided for incoming wires.

A variety of indicating lamp-holders and lenses can be used for all voltages



up to 120. Standard units can house one or two lamp units, one or two toggle switches or a combination of a lamp unit and a toggle switch. Switch plates can be furnished for mounting on a standard outlet box.

Applications are up and down indicator for liquids, temperature, elevator floor signal, markers, auxiliary light.

AS ADVERTISED IN TIME MAGAZINE

How to Answer
TIME-Readers' Questions About "Sky-Glo"

"Sky-Glo" is such a great forward step in lighting that you'd better be primed with answers to the questions you'll be asked. Here are a few. The rest are in the new free 28-page "Sky-Glo" Bulletin. Use the coupon for your copy.

"Sky-Glo" is the only nationally advertised luminous louvered lighting system. Benjamin developed and introduced "Sky-Glo" and there will be no other "exactly like 'Sky-Glo'." This distinctive and continuous "ceiling of light" has been thoroughly tested by the Benjamin Testing and Development Laboratory.

Made to Order for the Store Remodeling Boom!

"Sky-Glo" fits directly into the national trend toward interior modernization. No other single improvement can do as much for a store, office, schoolroom, bank, lobby or public building. Yet "Sky-Glo" actually costs less than many commonplace false ceilings.

Luminous Louvers

Unlike wood or metal slat louvers, "Sky-Glo" is TRANSLUCENT; has light transmission factor of 71 per cent. It is made of non-flammable thermoplastic Vinylite, product of Bakelite Corp.

Durable

"Sky-Glo" luminous louver panels will not discolor or become brittle with age. They will not warp or distort under prevailing room temperatures.

Stays Beautiful

The mat finish of "Sky-Glo" does not easily collect dirt, is kept sightly by occasional maintenance.

. . . The rest of the story about the first luminous louvered ceiling is in the new free "Sky-Glo" "SG" Bulletin, yours for the asking.

Be Informed!
MAIL COUPON NOW!

BENJAMIN ELECTRIC MFG. CO.,
Dept. K, Des Plaines, Illinois

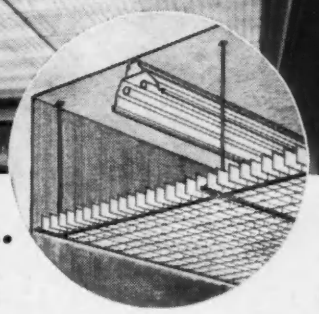
Gentlemen: Without cost or obligation please send me Bulletin "SG" with complete data on Benjamin "Sky-Glo."

Name.....

Firm.....

Address.....

City..... Zone..... State.....

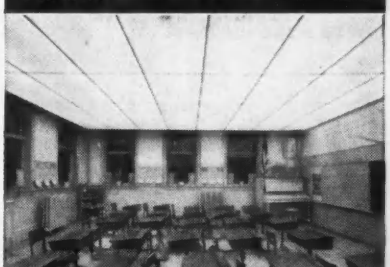


a NEW experience in Seeing..
more light, but **without** glare!

Use "Sky-Glo" to modernize your store or office! Conceal Outmoded Ceilings, Eliminate Extensive Alterations!

OFFICE Workers respond to "Sky-Glo's" eye-ease. Error and fatigue decrease, visitors are favorably impressed.

STORE "Sky-Glo" modernizes any interior, yet calls attention to the merchandise rather than to itself.



SCHOOL Better health, better energy application, better learning, easier teaching, come with "Sky-Glo".

From the translucent* "Sky-Glo" ceiling comes 75 to 125 footcandles of even, restful, shadow-free light, like the open sky—with no feeling of harsh brilliance! It's a new KIND of light from a new KIND of ceiling—a glorious all-over glow which quickly and economically modernizes any interior. This ceiling of light hides sprinklers, ducts and overhead unsightliness. It eliminates need for a "forest of fixtures" usually required to attain high lighting levels. Yet "Sky-Glo" costs less than many conventional false ceiling installations.

Mail Coupon for "Sky-Glo" Bulletin

Standard louvered "Sky-Glo" sections compose into handsome geometric patterns. They are hung readily, they fit any room shape and adapt on the job to pilasters and vertical piping. Rigid "Sky-Glo" is fire-safe, will not distort or discolor under normal room conditions. ***Send coupon for informative folder.***

**Unlike wood or metal slat louvers, "Sky-Glo" both transmits and reflects light. Made of Vinylite, product of Bakelite Corp.*

BENJAMIN
"Sky-Glo"
LUMINOUS LOUVERED LIGHTING SYSTEM

Product of Benjamin Electric Mfg. Co., Des Plaines, Illinois. Makers of a complete line of lighting equipment for Industrial, Institutional, Play Area and Utilitarian Requirements. Distributed Exclusively Through Electrical Wholesalers.

Benjamin Electric Mfg. Co., Dept. K, Des Plaines, Ill.
Gentlemen: Without cost or obligation please send "Sky-Glo" Bulletin to:
(Write name, firm and address in margin below)

Here's what you get in addition to the uniform quality and long life that results from forty-eight years of making lamps for industry by one of the largest and best-equipped lamp manufacturers in the world.

You get *Champion Economy* — production and distribution through qualified electrical and industrial supply houses is organized to insure minimum lighting and lower lamp cost.

You get *Champion Service* — trained experts in the field are quickly available to supply unbiased recommendations on lighting and lamp applications for every factory and office purpose.

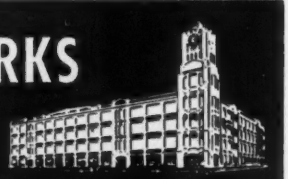
Why not get these extra premiums at no extra cost — in fact at lower cost. Next time get Champion Lamps.

Let us mail you a copy of the Champion Maintenance Manual M. It's full of useful hints on how to make the most of *planned lighting.*

CHAMPION LAMP WORKS

Lynn, Massachusetts

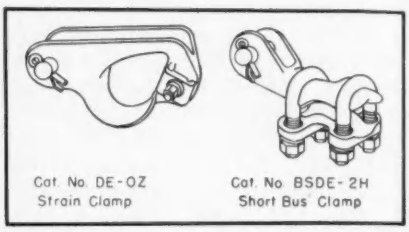
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO



Strain Clamps

A SMALL snubbing strain clamp, easy to install and with the bolt head recessed and self-locking has been developed by Electric Fittings Foundry, Birmingham, Ala. The cap is reversible to take different sizes of wire and is prevented from twisting under strain by contact with the exit lip of the clamp groove.

The company also has developed a



bus clamp that is very short, economically designed with snubbing action for use on short buses. The clamp develops a slip strength well in excess of what is required.

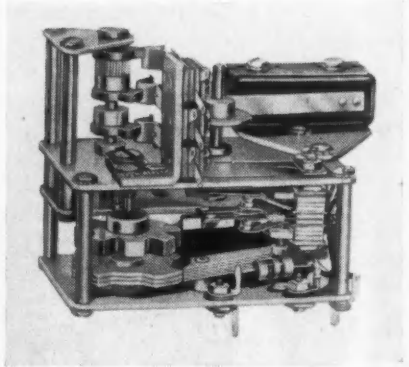
Both clamps are made of high-strength bronze and require no liners to avoid electrolysis and magnetic heating. Either can be supplied galvanized or cadmium plated for use on aluminum cable.

•

D-C Motor

A CONSTANT-SPEED d-c motor weighing approximately 10 oz has been announced by Anglo Corp, 4234 Lincoln Av, Chicago 18, Ill. It has a rotor shaft speed of 900 rpm and is available for use on voltages from 3 up to 110.

The new motor has applications where size and weight are factors to be



carefully considered. Basic motor frame and aluminum reduction gearing occupy a space $2\frac{1}{2}$x$3\frac{1}{2}$x$1\frac{5}{8}$ in.

Like the earlier model, the new motor utilizes the polarized magnetic drive principle of a actuating reed. This is the basis of speed control with d-c power, said to provide clock-like accuracy and synchronous operation with a-c equipment.

Write in your own figures--

The "AUTOMATIC WAY" SAVES IN FINAL COST

To be sure

"You can make figures prove almost anything you want to!"—and several of the above items are hard to evaluate. Many operating companies have found through actual experience, as well as by figures, that splicing with FARGO "AUTOMATICS" is the way to do it—on new construction as well as emergency repairs.

Distributed by
LINE MATERIAL COMPANY
Milwaukee, Wisconsin

FARGO

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie, N. Y.

LM

IDEAL *for* *Class Room Lighting*

. . . proved by actual tests

"Hairpinline"
U. S. PAT. PEND.

COLD CATHODE FIXTURES

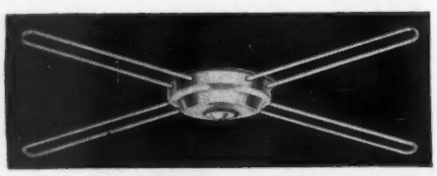
● In the final analysis the proof of any lighting fixture is its performance. It is by this standard that "HAIRPINLINE" Cold Cathode fixtures have proved superior in low surface brightness—in efficiency of lighting—in ultimate economy.

For example; in standard class rooms involving more than 15,000 lamps in 67 installations there was less than 1% replacement over an average period of 2 years.

"HAIRPINLINE" Cold Cathode fixtures are ideal for school lighting as they provide an even distribution of light over the entire class room—practically eliminate all shadows—and with the low lamp brightness require no louvers or glass to shield the lamps. They give approximately 100% light output.

Maintenance is practically nil, but in the event a replacement is necessary, you merely pull out the old lamp and insert a new one. A specially designed bracket facilitates quick—easy replacement.

For complete information we suggest you contact your local distributor.



UX-480 Lightaleer, Jr.—Designed especially for use with the modern cold cathode hairpin lamps and highly successful for class room lighting.

Illuminating Engineering Company
Designers and Manufacturers of Slimline and Cold Cathode Lighting Fixtures
2347 E. NINE MILE ROAD • • • HAZEL PARK, MICHIGAN

Thermal Load Relay

A NEW RELAY for automatic loading of power transformers to their full thermal capacity is announced by Westinghouse Electric Corp, Box 868, Pittsburgh 30, Pa. Actuated by a bimetal mounted in a well in the transformer wall in the top oil zone, the type TRO relay continuously evaluates the hottest-spot temperature of the copper windings to operate three snap-action, self-resetting switches. The first switch operates with increase of transformer load to start cooling fans. If load increases and approaches the safe thermal operating limit, the second switch closes to give a warning. If load continues to increase until the thermal limit is reached, the third switch either trips the breaker or gives an alarm.

A load-time-temperature characteristic is obtained. Contacts are normally self-resetting. A seal-in feature for any of the controlled circuits is available requiring the manual operation of a switch or push button for resetting.

•

Electric Truck

LATEST ADDITION to the "Standrive" fork trunk line is a 1000-lb capacity electric truck in telescopic and non-telescopic models, made available by Lewis-Shepard Products Inc, 278 Walnut St, Watertown 72, Mass.

This new member of the line is designed to carry full 48 in. long loads of maximum capacity. Telescopic model with collapsed height of 83 in. gives 103 in. lifting height. Pivot point steering permits operation in confined areas. Brakes are the "deadman" type, are released by depressing brake pedal, and are automatically applied when truck is unattended. There are only five lubrication points.

•

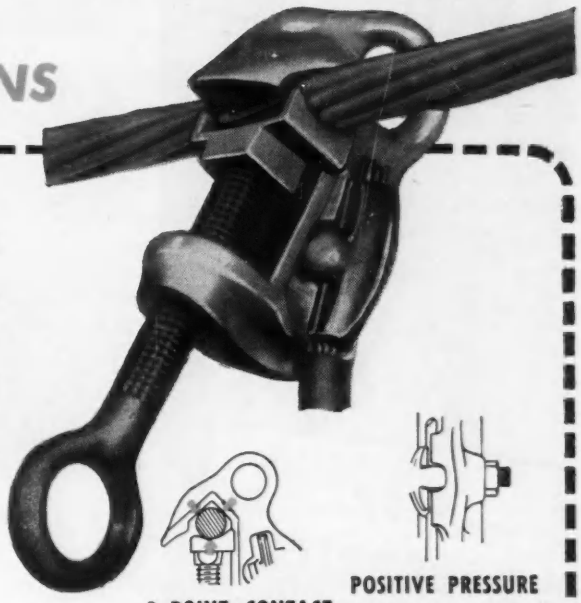
Flue Gas Analyzer

FOR CONTINUOUSLY indicating and recording stack gases as a guide to more efficient combustion, a flue gas analyzer has been introduced by Davis Emergency Equipment Co, 45 Halleck St, Newark 4, N. J. A newly designed flow scheme utilizes the differential pressure in the stack to cause an ample and continuous flow of stack gases through the analysis cell.

The analyzer consists of a recorder and panel 2 ft wide x 6½ ft high and a Davis flow panel to be mounted near or at the point of sampling. It is operated from 110-v 60 cycle power supply employing a Wheatstone Bridge and a stainless steel analysis cell for measuring the thermal conductivity of the composite stack gases.

CHANCE *Conductor Clamps*

FOR HOT TAPPING... HOT OR COLD CONNECTIONS



PERMA-GRIP TAP CLAMPS stay put without vibrating loose, but can be readily unscrewed and removed with a Clamp Stick. These clamps feature a three point contact to handle the load and provide an exceptionally tight grip. A positive pressure jumper connection makes a secure, vibrationless contact that doesn't heat or burn. Chance Perma-Grip Tap Clamps are made for tapping to aluminum, copper or steel conductors and are obtainable in a complete range of sizes to meet all requirements.

3-POINT CONTACT

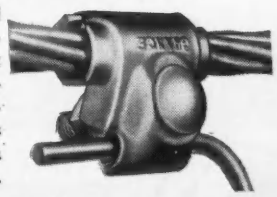
POSITIVE PRESSURE JUMPER CONNECTION

CHANCE FLIP-TAP CLAMPS

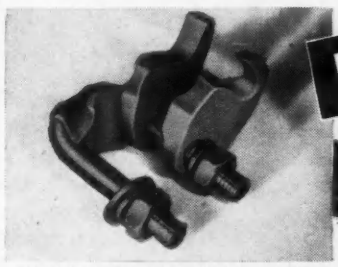
make a strong, permanent connection that holds tight, yet is easily removed when line changes are made. Sticking is prevented by a corrosion resisting compound in a grease chamber in the body of the clamp. Threads unscrew easily, regardless of atmospheric conditions or length of time the clamp has been in service. Flip-Tap Clamps are available for all types of conductors ranging in size from No. 8 solid copper to 4/0 stranded copper.

PARALLEL GROOVE CONNECTORS

Heat treated aluminum, galvanized contact copper, or all copper. Inexpensive, easily installed, light weight connectors for use on line construction. All connector bodies plus galvanized bolts, nuts and lock washers are corrosion resistant. Available in a complete range of types and sizes.



CHANCE U-BOLT CONNECTORS



APPLY TO CONDUCTORS WITHOUT REMOVING NUTS

A brand new idea for U-Bolt clamps—a swinging center spacer and base that eliminate the necessity of removing nuts and lock washers when applying conductors. No lost nuts or washers—quicker, easier application. Another important feature: *three* sizes for *all* conductors from No. 4 solid copper to 500,000 CM. Available for aluminum or copper conductors.

MAY BE APPLIED "HOT"

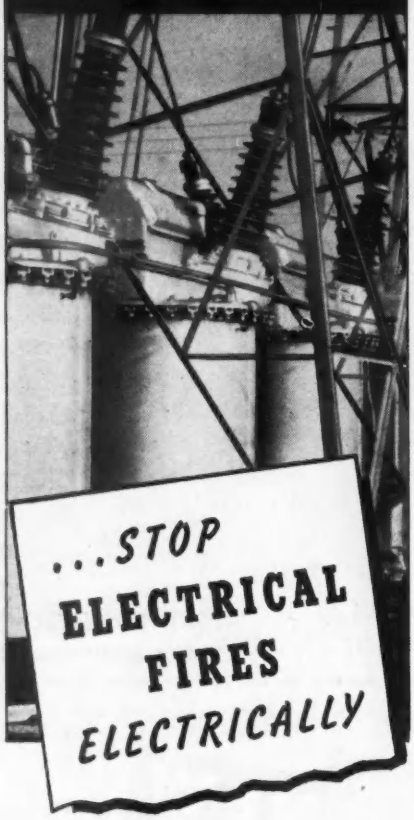
Swinging center spacer and base permits clamp to be placed over a line conductor with a hot stick. Spacers and jumper can be positioned and nuts tightened with an insulated wrench, making a permanent connection on a hot line.

A·B·CHANCE CO·

210 N. ALLEN STREET CENTRALIA, MISSOURI · 615 TENNESSEE STREET SAN FRANCISCO 7, CALIFORNIA

ABC INDUSTRIES

BLAW-KNOX
FIRE PROTECTION SYSTEMS



...STOP ELECTRICAL FIRES ELECTRICALLY

Blaw-Knox electro-thermostatically controlled fire protection systems *act instantly*. They respond to either abnormal rate of rise in temperature or to temperature above a fixed maximum. Valves, alarms, fire pumps, and other protective devices are activated *with the speed of electricity*.

Blaw-Knox Fog Nozzles are especially adapted to, and approved for, protection of transformer banks and similar installations.

Blaw-Knox Fire Protection Equipment is listed by Underwriters Laboratories, Inc. and approved by Factory Mutual Laboratories.

When writing, ask for Bulletin No. 2207

BLAW-KNOX
SPRINKLER DIVISION
of Blaw-Knox Construction Company
829 Beaver Avenue, N. S.
Pittsburgh 12, Pa.
Offices in Principal Cities

Motor-Generator Sets

To OPERATE magnetic chucks such as used on vertical spindle and rotary surface grinders, a line of motor-generator sets has been designed by the Motor Generator Corp, Troy, Ohio. The sets are available in generator capacities

ranging from 500w through 25 kw, d-c. Size of generator required depend upon the size of the magnetic chuck and whether it is the circular or rectangular flat type, and if multiple chucks are to be operated from one generator.

•

Soldering Iron

KNOWN AS "Soldetron," a soldering iron having a weight of 3 oz is being manufactured by Transvision Inc, New Rochelle, N. Y. Overall size of iron is 9¼ x 15/16 in.

The iron is reported to heat in 20 sec from a cold start; cools upon release of finger control button; and quickly reheats when button is pressed. Tip-heads are interchangeable; long, medium or stubby are provided; each incorporates the heater element. Bakelite handle with cork covering provides comfortable cool grip.

The iron can be operated on a 110-v, 50-60 cycle circuit when a transformer is furnished, or 6-8v a-c or d-c, without transformer or as from an automobile battery.

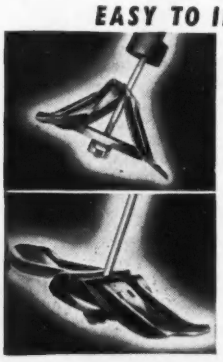
P-L*
EARTH ANCHORS

*REA APPROVED

P-L ALL STEEL, EXPANDING TYPE EARTH ANCHORS

Here is the first really efficient, two-piece earth anchor that is of simple, fool-proof, all-steel, heavy-duty construction. P-L Earth Anchors are exceptionally rugged and possess tremendous holding power. P-L Anchors can do a better job and can be installed quicker in all types of soil. Everyone from the engineer to the lineman can appreciate the ease of handling and installation.

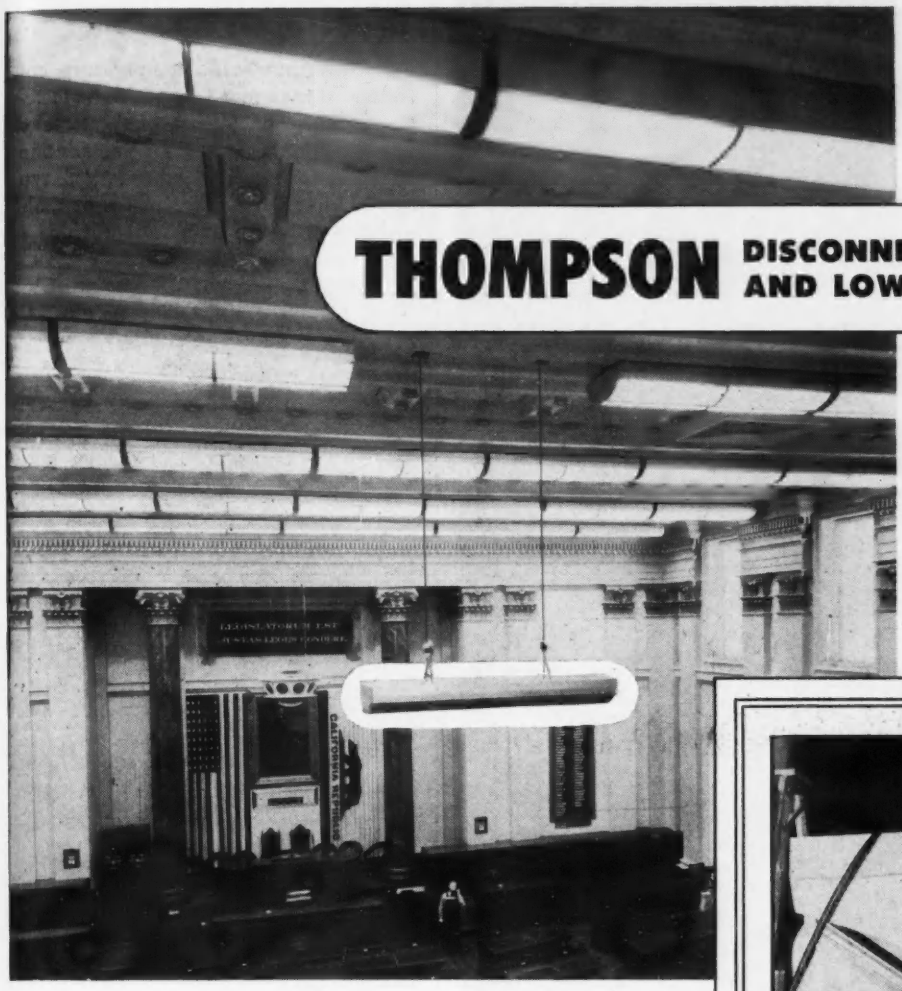
EASY TO INSTALL



P-L Anchors come to you as assembled units. Built of two simple pieces of heavy steel plate. A few blows of the tamping bar and the sharp edged blades cut deeply and permanently into solid, undisturbed earth.

FOR LITERATURE WRITE

PIEPER-LILLARD
INCORPORATED
ST. LOUIS 1, MO.



THOMPSON DISCONNECTING AND LOWERING HANGERS

make high bay FLUORESCENT LIGHTING *feasible*

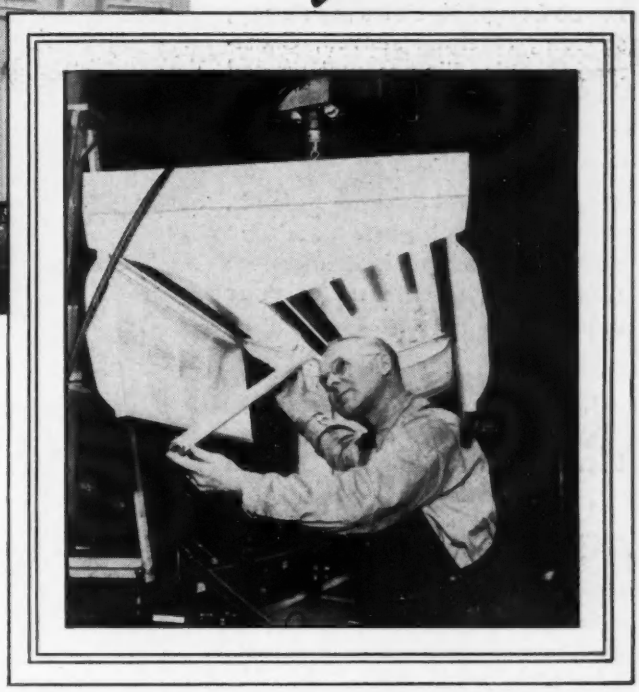
Fixture being lowered

The problem of cleaning and relamping a high bay fluorescent lighting system approximately 33 feet above floor level and containing 382—40 watt 3500° white tubes can only be solved economically with Thompson Disconnecting and Lowering Hangers. That's why they were specified as an integral part of the lighting system in the State Assembly Chamber at Sacramento, Calif.

Each fixture is lowered separately to desk top level—electrically "dead". A simple test block arrangement is provided to facilitate final inspection after cleaning and relamping. The 250-pound units are easily winched back to operating position and are automatically re-aligned.

MAKES AIR CONDITIONING PRACTICABLE

The former incandescent lighting system requiring a total connected load of 52,500 watts caused such a temperature rise that when added to normal summer temperature, it made the air conditioning system practically ineffective. The use of fluorescent 40-watt 3500° white tubes provided 40 ft. candles at desk height and the low temperature rise solved the air conditioning problem.



Fixture being Relamped and Tested

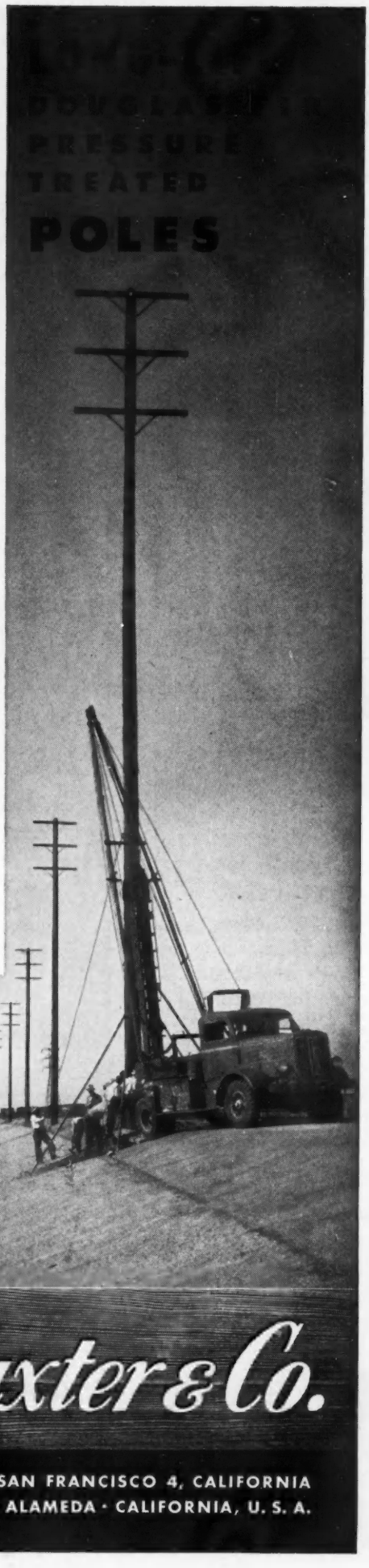
The easy access to lighting fixtures afforded by Thompson Hangers permits frequent cleaning—scheduled relamping—and assures constant foot candles on the desk surfaces to specification.

THOMPSON
DISCONNECTING & LOWERING
HANGERS

We invite you
to use THOMPSON *Engineering Service*

THE THOMPSON ELECTRIC CO.
1101 POWER AVENUE • CLEVELAND 14, OHIO

BAXCO



In transmission lines–distribution, lighting or telephone systems–wherever dependable service is of prime importance you can count on Baxco Long-Life Poles to do the job.

Baxco Long-Life Poles are strong, straight, machine shaved, Coast-type Douglas Fir pressure treated with creosote and pentachlorphenol to resist rot, termites and deterioration.

You'll be proud of these poles in your line and more than satisfied with their long maintenance-free service. Write or wire us your inquiries.

Also Produced by
J. H. Baxter & Co. of Oregon
an associated company
Plant and Yard–Eugene, Oregon

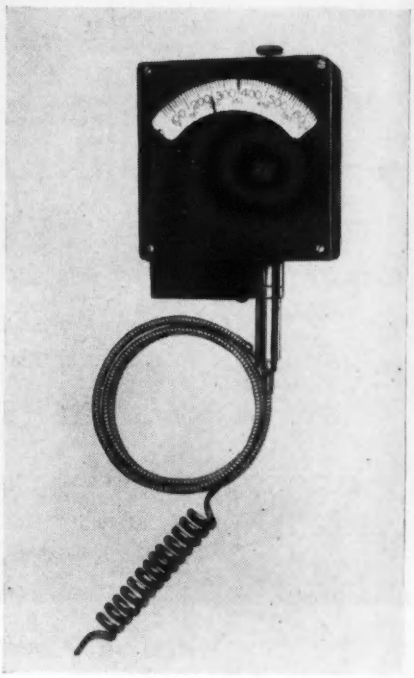
J. H. Baxter & Co.

333 MONTGOMERY STREET · SAN FRANCISCO 4, CALIFORNIA
LOS ANGELES · LONG BEACH · ALAMEDA · CALIFORNIA, U. S. A.

Temperature Controller

A NEW INDICATING temperature controller is announced by United Electric Controls Co, 85 School St, Watertown, Mass. It is designed for installations such as mechanical convection type ovens, liquid baths, hot plates or molding dies. A thumb screw is provided in top of case for adjustment.

Overall dimensions of case are 5½x 5½x1¾ in. and the control weighs 3 lb. Standard model is fitted with a copper



bulb assembly. Standard ranges 50 to 350 F and 50 to 600 F are offered, or special ranges may be had between the limits of minus 120 F to plus 600 F. Differentials available are from 0.5 F in circulating liquid to 2 F in air. Standard switch ratings are 10 amp. 125v and 5 amp. 250-v, a-c.

•

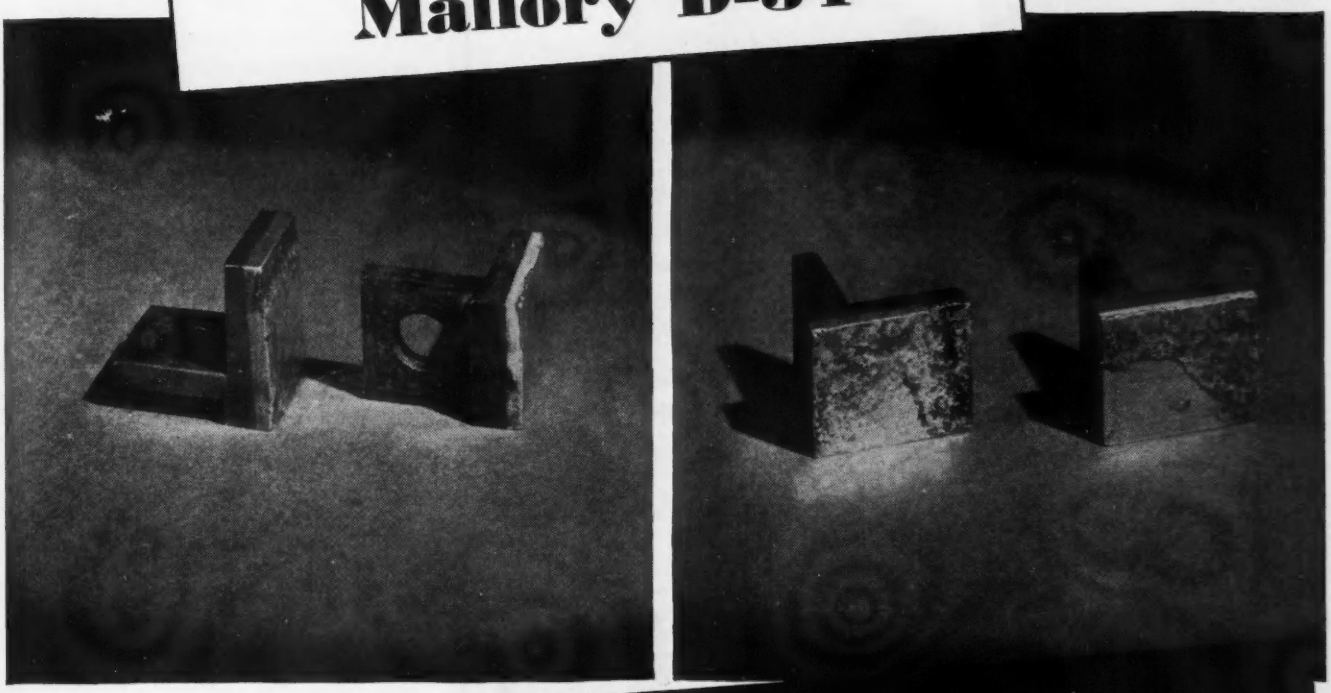
Selenium Rectifier

FOR UNATTENDED battery charging, a selenium rectifier has been developed by Industrial Electronics & Transformer Co, 1801 East Slauson Av, Los Angeles 11, Calif. Installations may be substations, railroad signal systems, municipal fire and burglar alarms.

The units are designed with voltage regulating transformers to compensate for variations in a-c line voltages. Floor standing cabinet, wall mounted cabinet and wall mounted ebony asbestos panel, are the three models available.

Output current is 4, 6 and 12 amp, output voltage is from 3 to 60 cell ratings (booster charging feature included) with the a-c input either 110 or 220 v.

They're made of Mallory D-54*



FACE VIEW

SIDE VIEW

... that's why they operated over 150,000 times with practically no wear

If you have an application that requires non-sticking, low contact resistance at high currents, we suggest Mallory D-54 as a well-proved metal for the job.

Mallory D-54 metal is a contact material of silver and cadmium oxide. Its electrical conductivity is very high and, at the same time, it has non-sticking properties. Operated continuously over long periods, it maintains a low contact resistance and shows practically no material loss. Its price compares favorably with that of silver itself.

Because of these reasons, D-54 is widely used in industrial electric truck contactors, motor starting contactors and industrial relays and switches.

The contacts you see above are faced with a 1/8" thickness of D-54 and were used in an industrial electric truck. After more than 150,000 makes and breaks, they are practically as good as new. This performance is quite typical of D-54. We'll be glad to tell you more about D-54—glad to contribute engineering assistance also.

(Above)
Complete ordering information on the Mallory line of Contacts and Contact Materials will be found in this catalog.

(Below)
The Mallory Contact Data Book contains everything you want to know about contact design, construction, application and materials. Free to engineers who write on company letterhead. $2.50 to others.

IT'S 5000 TO 1 THAT A MALLORY STANDARD CONTACT WILL MEET YOUR "SPECIAL" REQUIREMENTS

In Canada, made and sold by Johnson Matthey & Mallory Limited, 198 Clinton Street, Mount Dennis, Ontario.

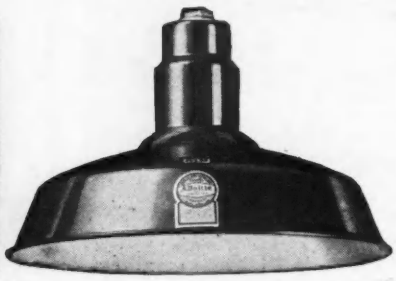
*Reg. U. S. Pat. Off.

P. R. MALLORY & CO. Inc.

MALLORY ELECTRICAL CONTACTS & CONTACT ASSEMBLIES

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

LIGHT *where you want it . . .*



This ABolite reflector is designed to provide maximum lighting over a given area. It is an RLM shape that conforms to specifications of the technical committee of RLM Standards Institute. You can specify and recommend ABolite Reflectors with full assurance that they will provide maximum lighting efficiency and economy.

RLM Standard Dome illustrated. Made also with separable, Duo-Move, ventilated, easy-detachable, threaded and heel necks.

Sold only through wholesalers

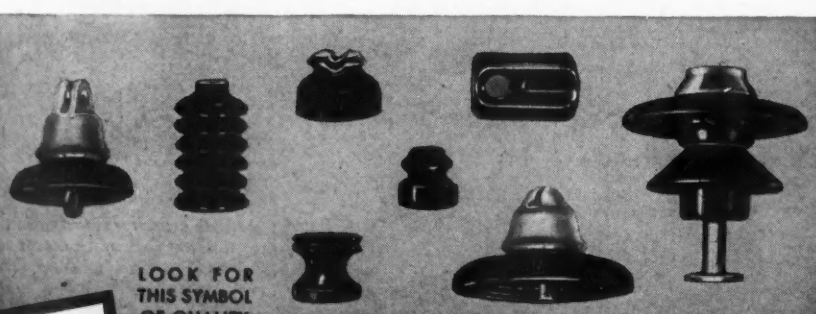
THE JONES METAL PRODUCTS CO., West Lafayette, Ohio

ABolite REFLECTORS PORCELAIN ON STEEL

ANOTHER STEP IN THE PROGRESS AND GROWTH OF VICTOR...OUR NEW, MODERN KILN NO. 3...

For DEPENDABLE Insulators Specify VICTOR

HIGH tension porcelain insulators made at Victor have passed the most *severe* tests on countless types of installations during the past 50 years. For safety, service and satisfaction, specify "Victor." We are doing our utmost to maintain dependable deliveries.



LOOK FOR THIS SYMBOL OF QUALITY

V

VICTOR INSULATORS, Inc., Victor, N. Y.

BIRTHPLACE OF FIRST WET PROCESS HIGH-VOLTAGE INSULATORS

Fire Alarm System

DEVELOPMENT of the type SA Master Code fire alarm system for schools, dormitories, small hotels, churches, office buildings and similar places has been announced by Autocall Co, Shelby, Ohio.

The system consists of break-glass, non-code fire alarm boxes, fire alarm signals and a control panel. It is the closed circuit type alarm system and can be obtained for operation on 125v or less, a-c or d-c.

Reliability of operation is featured through electrical supervision of component parts. Such supervision insures sounding a "trouble" bell in event of circuit difficulties, yet no false alarms are sounded.

An outstanding feature is the method of adjusting signal transmission to match the rhythm of the marching feet. This feature is exceptionally valuable in school use.

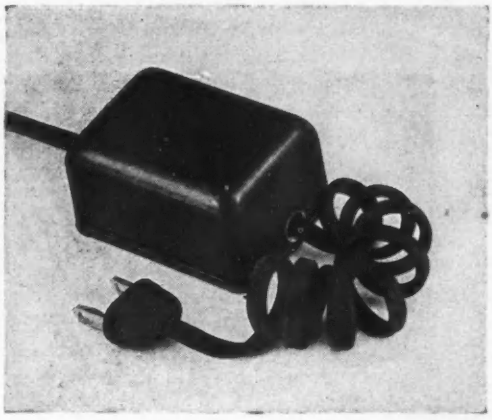
MORE NEW PRODUCTS about which you should know

Certified Electric Corp, Warren, Pa. announces a fluorescent **spiralamp** with a brighter inner surface in an attractive motif . . . Industrial Products Co, 2808 N. Fourth St, Phila, Pa. has developed a new line of **lamp changers** designed to remove and replace lamp bulbs in high and out of way places . . . The Mueller Electric Co, 1583 East 31st St, Cleveland 14, Ohio, produces a new **clip** with jaws on both ends known as the No. 22 Twin-Clip . . . Beta Electronics Co, 1762 Third Ave, New York, N. Y. announces the Model 251 regulated low-current **power supply** for currents below 10 milliamperes at voltages up to 500 d-c . . . The Dial Light Co of America, Inc, 900 Broadway, New York 3, N. Y., has developed a new **pilot light** with a "multione" cap which is effective with neon lamps . . . Farrelry Co, 1245 No. 26th St, Philadelphia 2, Pa. produces a **surface-coating** for removal of rust, protection from corrosion and preparation for paint . . . Ronaflex Tubing Co, 1111-A Packard Bldg, Philadelphia 2, Pa. announces the Ronaflex assemblies, **tubing** with snap-on couplings interchangeable with various nipples . . . Davis Emergency Eqiupment Co, Inc, 45 Hallock St, Newark, N. J. has developed a **safety dial** for solving hazard problems . . . The Crown Industrial Products Co, 1529 E. 53rd St, Chicago, Ill. announced a new electric panel type **tachometer** for providing continuous speed measurements.

Accepted

BY LEADING MANUFACTURERS

As Standard of Quality



Plug-thru type Single 6 watt—No. PT 106. 8 watt—No. PT 108. 14 watt—No. PT 114. 20 watt—No. PT 120. 2—14 watt in series. No. PTS 114. Mounting brackets supplied. U. L. and C. S. A. Approved.

Fluorescent fixture manufacturers know that their equipment will stand up if the ballast is by Wheeler. More and more they have come to depend on Wheeler ballasts for long life, trouble free, and efficient operation. These qualities — that assure top performance — are the result of precision manufacturing. Every ballast is the product of supervised skilled craftsmen, of critical testing, of carefully worked out engineering techniques . . . Indeed Wheeler Ballasts have become the "Accepted Standard of Quality" in several outstanding lines.

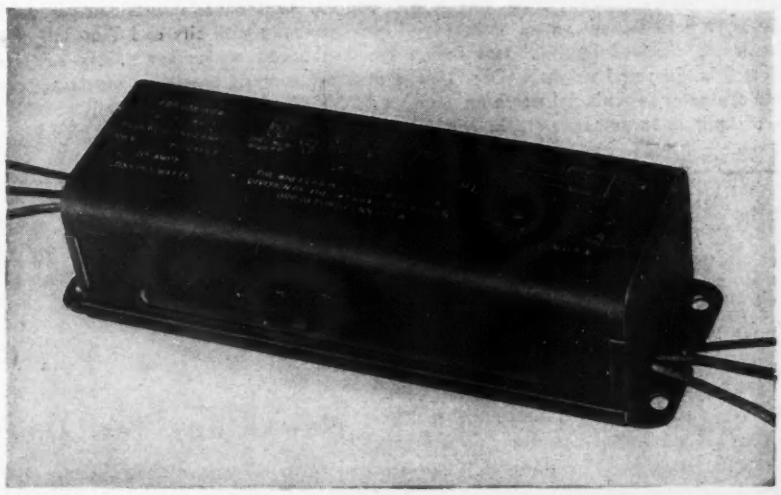
. . . Write at once for complete information on

WHEELER BALLASTS for
- Fluorescent Fixtures and Portable Lamps

WHEELER BALLASTS for
- Circline Lamps

WHEELER REMOTE CONTROL
- equipment for slimline lamp operation

WHEELER QUALITY MAGNET
- WIRE—LITZ WIRE—COIL WINDINGS—SPECIALTY TRANSFORMERS



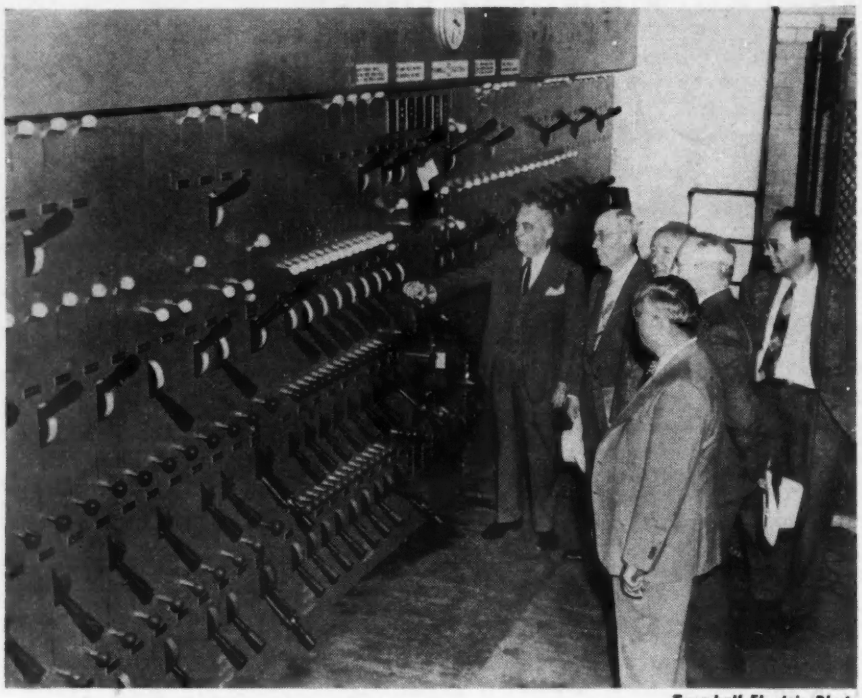
No. 241 B, "Brick" Type 2 lt.—40 watt 118 volt 60 cycle, 220 volt 50 cycle, 220 volt 60 cycle. High power factor. U. L. and E. T. L. Approved.

THE WHEELER INSULATED WIRE CO., INC.

Division of The Sperry Corporation

1307 WASHINGTON AVENUE BRIDGEPORT 4, CONN.

MANUFACTURERS and MARKETS



Trumbull Electric Photo

LARGEST oil hydraulic-controlled stage switchboard in the world is claim made by Trumbull Electric Manufacturing Co for this installation in the Philadelphia Municipal Auditorium. Mayor Bernard Samuels, hand on a control lever, is shown with city and Trumbull officials as the board received its final test before the Republican convention. Main switchboard is 23 ft 8 in. long and weighs 19,000 lb. The auxiliary controls consisting of a magazine panel and contactor switchboard weigh an additional 9,000 lb. Switchboard controls about 1,500,000 w of light in three colors, 1,000,000 w by means of 125 radial autrastats of 8,000 w each.

GE Lamp Department Adds Five New Sales Districts

Addition of five new sales districts to the nationwide sales set up of General Electric Co's Lamp Department has been announced by M. L. Sloan, vice-president and general manager of the Lamp Department at its Nela Park headquarters in Cleveland. Also announced was the appointment of the managers for these districts.

The new sales districts, headquarters cities, and persons appointed to head each district follow:

Chicago sales district, T. D. Scarff, manager; Midland sales district, Chicago, D. O. Dice, manager; Iowa-Illinois sales district, Davenport, F. C. Horton, manager; Wisconsin sales district, Milwaukee, W. B. Gustafson, manager; and Indiana sales district, Indianapolis; J. M. Lime, manager.

A. H. Meyer, who for more than 30 years served as manager of the former Midland sales district of the Lamp Department, will continue in an advisory capacity to the managers of the new districts.

•

New X-Ray Test Unit

A newly developed x-ray unit is receiving its first commercial use at the Beaver Falls (Pa.) plant of the Babcock & Wilcox Tube Co, officials of the company have announced. The recently purchased fluoresence analysis unit, one of the first five such units constructed, makes possible non-destructive, rapid, quantitative analysis of the elemental constituents of metals, alloys, chemical mixtures and compounds, minerals and ores. The new equipment, all of which was built by the North American Philips Co, will be used for fundamental research as well as for investigating practical metallurgical problems.

Westinghouse to Offer Employee Security Plan

Westinghouse Electric Corp has announced a proposal for a "single uniform security package" for employees.

In a letter to employees, Gwilym A. Price, president, estimated the program would cost the corporation $13,500,000 to $16,000,000 a year. He said the management has been working on the program for more than a year and will offer it to employees "when the company's payroll and material costs are stabilized so that we are certain we can afford the increased expense."

The program would provide pensions, life insurance, sickness and accident insurance, hospital and surgical insurance.

The company said that an employee with 30 years' service would be able to retire with a combined company pension and Social Security payments equal to about 40% of his average regular monthly pay.

Westinghouse would pay about two-thirds of the pension plan cost, while the employee would pay 2½% of his first $3,000 of regular earnings, plus 5% of earnings above $3,000. Should an employee leave the company all his contributions, with interest, would be refunded to him. The company-estimated cost of the insurance to employees would range from 60 cents to $1.45 a week, depending on base pay and the number of dependents that the employees have.

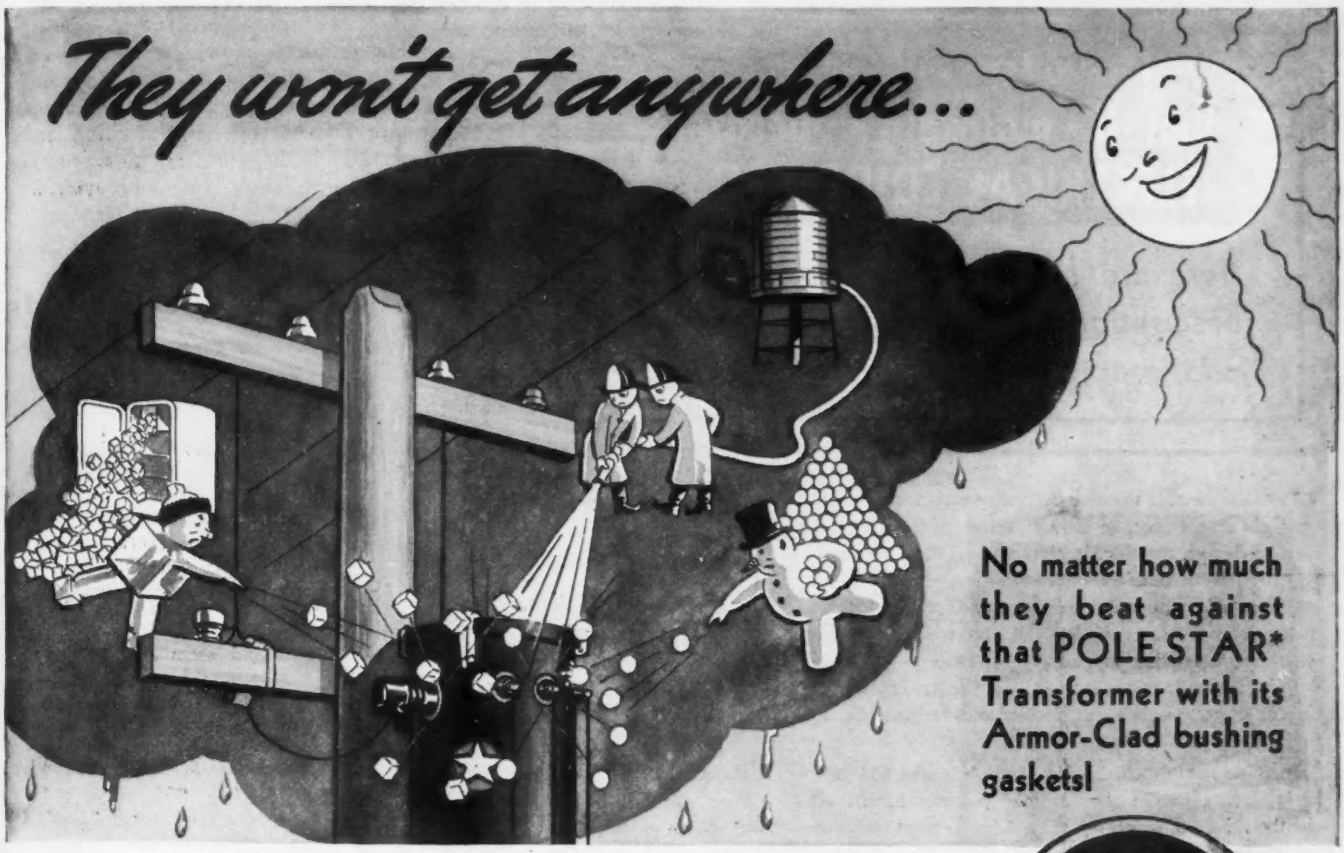
•

Furniture Store Appliance Sales Plan Presented

A sales training program for supporting large investments in rapidly expanding furniture store appliance departments was presented recently by Hollis C. Doss, sales planning manager, Hotpoint Inc, who revealed that furniture stores now account for 20% of the company's sales volume. Mr Doss addressed a group of Graybar distributors from nine mid-western cities, who attended the company's three-day sales training conference held in Chicago.

Mr Doss urged distributors to support furniture store appliance retailers by helping to organize sales programs and campaigns. He cited these specific

They won't get anywhere...



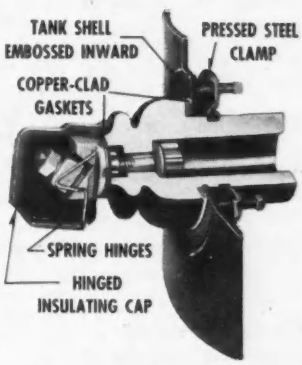
No matter how much they beat against that POLE STAR* Transformer with its Armor-Clad bushing gaskets!

COPPER-CLAD BUSHING GASKET

Old Sol is right, and here's why:

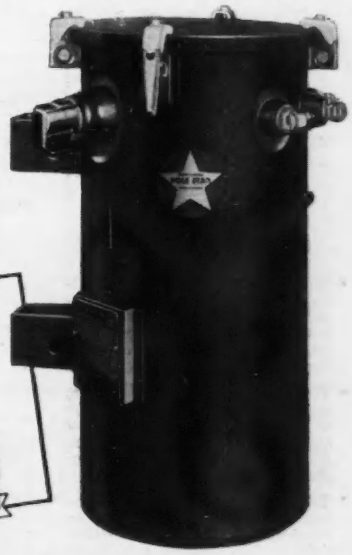
Exposed edges of all POLE STAR sidewall bushing gaskets are protected from the weather by copper rims. This armor cladding gives gaskets absolute protection from the weather. POLE STAR bushing gaskets can "take" the constant pounding of rain and ice that seek to eat away the gasket edges.

Making a line connection with a standard wrench.



Cross section of High Voltage Sidewall Bushing.

High voltage bushing terminals are protected by insulating caps which swing in and out of position on non-corroding spring wire hinges. Caps are self-supporting above the terminals, leaving connectors completely exposed so the linemen can see the connections they are making. Connections are made with a standard wrench.



Embodying a new wound core design with an inherent low exciting current, POLE STAR Transformers are made in sizes 25 Kva and below, 14400 volts and below, single phase, 60 cycles, OISC, conforming to EEI-NEMA Standards.

* **P.S.** let the POLE STAR be your guide

Product Of Long Experience

Safe Thrifty And Reliable

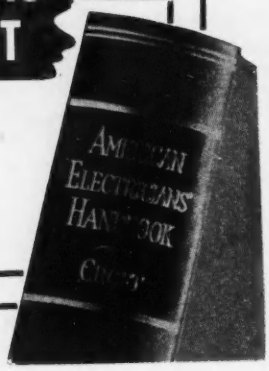
Pennsylvania TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

PITTSBURGH 12, PENNSYLVANIA

How to . . . . . install • maintain • operate ELECTRICAL EQUIPMENT

Here are hundreds of detailed descriptions, rules, methods, and practical wiring data



YOU'LL be able to solve every-day electrical problems right on-the-spot, as 185,000 other users do with the help of this great guide. It gives you all the information you need for the selection, installation, operation, care and proper application of electrical apparatus and materials. Contains complete data on wires and cables —splicing—installation and care of motors—capacitors —lighting equipment, etc.—PLUS the latest information on electron tubes and circuits and their application in industry.

Imagine how much this information means to you!—in increasing the number of jobs you can handle efficiently . . . in speeding your advancement, in time, energy and effort saved! Gain all this from the single, authoritative, convenient handbook that has become the "bible" of electrical men throughout the country.

AMERICAN ELECTRICIANS' HANDBOOK

by TERRELL CROFT, *Consulting Engineer*
Revised by Clifford C. Carr

1734 pages, over 400 tables, 1327 illus. $6.00

With this trouble-shooting book at your fingertips, you'll see how quickly work problems can be simplified. In easy-to-understand language you are given the RIGHT facts in the form you want them—thoroughly indexed for quick finding. It covers everything from explanations and definitions of fundamentals to suggestions and ways for remedying the troubles of electrical equipment and maintaining high operating efficiency. It presents the kind of information that helps all practical electrical men, beginners or experts—wiremen, contractors, linemen, plant superintendents, operators, and construction engineers.

New 6th Edition JUST OUT!

11 Big Divisions discuss and Explain:

—Fundamentals of Electricity
—Properties and Splicing of Conductors
—Circuits and Circuit Calculations
—General Electrical Equipment and Batteries
—Transformers
—Electron Tubes and Circuits
—Generators and Motors
—Outside Distribution
—Interior Wiring
—Electric Lighting
—Wiring Tables

SPECIAL FEATURES

- **Simple instructions for calculating load on circuits, and for selecting proper wire size to meet both satisfactory voltage drop and current carrying capacity conditions.**
- **Practical data on operation, care, installation, and selection of motors and their control equipment — including detailed information on the planning of motor circuits and drives.**
- **Up-to-the-minute information on outside distribution — covering construction methods and materials.**
- **Helpful suggestions on installation, care and proper loading of transformers.**
- **Complete data on all commonly employed electric wires and cables.**
- **Over 64 handy wiring tables, arranged in convenient order for rapid use.**

New 6th Edition BIGGER and BETTER than All Previous Revisions!

Over 250 pages of entirely new material, including 150 new illustrations, have been added. Brought completely up-to-date with the best present day practices and in accordance with the 1947 NATIONAL ELECTRICAL CODE.

Just a Few of the 400 dependable tables:

Tables for easy determination of profits and discounts; tables of diameters and weights of common types of wires and cables; maintenance table for Cooper-Hewitt A-c Lamps; table on the troubles of D-C Motors and Generators—their localization and correction; Properties of metals and alloys, and many others.

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Send me Croft's **AMERICAN ELECTRICIANS' HANDBOOK,** Sixth Edition, for 10 days' examination on approval. In ten days I will send $6.00, plus a few cents postage, or return the book postpaid. (Postage paid on cash orders.)

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Company .....
Position W-7-31-48

aims: schedule consistent advertising; arrange for windows displays, demonstration displays and "live" demonstrations; start a direct mail campaign to store customers; hold morning sales meetings in the store; set up a prospect "after store hours" follow-up system.

•

Manufacturers Make New Sales Assignments

Electrical manufacturing companies have recently made the following appointments to their sales staffs:

Square D Co, Detroit, has appointed S. T. Walz to manage the southeastern region, which includes the Atlanta, Charlotte, Jacksonville and Birmingham district offices, with headquarters at Atlanta. He was formerly Birmingham district office manager. K. R. Morris, with headquarters at Baltimore, will manage the eastern region, which includes the Baltimore, Philadelphia, York and Richmond district offices. Mr. Morris was formerly Baltimore district office manager. R. W. Thompson will manage the midwestern region, with headquarters at St. Louis. The region includes the St. Louis, Kansas City, Moline and Omaha district offices. Mr. Thompson was formerly Chicago district office manager.

Rockbestos Products Corp, New Haven, Conn., has announced that H. B. Hammond has been relieved of his duties as district manager of the New York office to devote himself exclusively to the servicing of all departments of the Federal Government in Washington, D. C., and all private shipyards on the East Coast. His business will be at company headquarters in New Haven. J. T. Williams, formerly Cleveland office manager, has been appointed New York district manager. D. S. Lee, formerly district manager of the Buffalo office, which has been discontinued, was transferred to the Cleveland office as district manager and the Buffalo district was incorporated in the Cleveland office territory. S. A. Sargent, formerly district representative of the New England territory, has been transferred to the Chicago district office. R. G. Newton, formerly sales promotion manager of the New Haven office, has been appointed district representative of the New England territory with headquarters in New Haven.

C. I. Hayes, Inc. Providence R. I., has appointed Leonard J. Edwards New England sales representative, with offices at the company's headquarters, 75 Baker St, Providence, R. I.

Lindberg Engineering Co, Chicago, has appointed Ralph S. Poulsen district sales manager for the Ohio territory, with offices at 815 Superior Av, Cleveland 14, Ohio.

A. B. Chance Co, Centralia, Mo., has appointed three new salesmen—Robert G. McCulloch, Winfield G. Michaelis and Robert L. Scott. Mr McCulloch will travel Alabama and eastern Tennessee from headquarters in Birmingham. Mr Michaelis, will locate in Columbus, selling Ohio and eastern Kentucky and Mr Scott will represent the company in Indiana and western Kentucky from Indianapolis.

PLANNED LIGHTING FOR LOAD BUILDING INCLUDES LOCALITES

BALANCED LIGHTING is the *practical* application of lighting for all industrial work areas. It includes (1) Localized Lighting for machining, assembly, inspection, etc., and (2) General lighting to avoid too great a contrast between the illumination of the immediate work area and the surrounding area.

LOCALIZED LIGHTING directs the proper quantity of illumination on the *immediate* work area of each operation, according to the seeing requirements of the worker for the particular task. Localized lighting units have many uses in your industrial customers' plants—and add up quickly in your load building program.

1. PROFITABLE REVENUE FOR UTILITIES
2. ECONOMICAL LIGHTING FOR INDUSTRY
3. EFFICIENT "SEEING" FOR WORKERS

You get all three with Balanced Lighting—a greater connected load for utilities—an economical, more productive tool for industry and greater efficiency for workers. Balanced Lighting is Planned Lighting at its BEST. It belongs in your Planned Lighting Program.

Industry Likes Localites . . .

Thousands of industrial plants now use Localites in varying quantities with connected loads ranging from 50 to 500 K W and more. A few typical users are:

BENDIX CO.
South Bend, Ind.

BENRUS WATCH CO.
Waterbury, Conn.

CATERPILLAR TRACTOR CO.
Peoria, Ill.

CRANE CO.
Chicago, Ill.

THOMPSON PRODUCTS
Cleveland, Ohio

GENERAL ELECTRIC CO.
In All Divisions

HAYNES STELLITE
Kokomo, Ind.

JOHNSON MOTORS
Waukegan, Ill.

NEW BRITTAIN MACHINE
New Brittain, Conn.

UNDERWOOD CORP.
Hartford, Conn.

THE FOSTORIA PRESSED STEEL CORP., FOSTORIA, OHIO, U. S. A.

BALANCED LIGHTING Fostoria
GENERALITES for Overall Lighting • LOCALITES for Light ON the Job
Trade Mark Reg. U. S. Pat. Off.

Request Full Information. Be sure your Planned Lighting Program for load building includes full understanding of BALANCED LIGHTING. Fill in the coupon below for helpful brochures and catalogs for your Lighting Sales Department personnel and for customer use.

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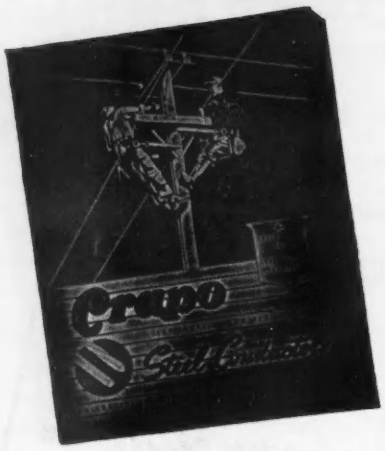
Where and How to Use *Crapo* Steel Conductor



Ask for This Guide to Low-Cost Rural Lines!

If future plans call for the extension of rural service, be sure to ask for a copy of this Manual! A study of its contents will show where and how *Crapo* Steel Conductors can be used to profitable advantage in rural distribution systems.

This illustrated book contains pertinent data on the electrical characteristics and electrical performance of these unique conductors. It shows how construction costs can be reduced and final sag and tension data, describes construction practices, cites typical installations.

***Crapo* Steel Conductors are especially applicable to rural taps and branches where construction and maintenance costs are important considerations. The experience of a number of leading utilities over a period of years shows conclusively that *Crapo* Steel Conductors are giving dependable, economical and efficient service on thousands of miles of line in rural areas.**

***Crapo* Steel Conductors are distributed by Graybar Electric Company, Inc. Ask a Graybar representative for a copy of the *Crapo* Steel Conductor Manual or write direct for Manual No. 110-C.**

Indiana Steel & Wire Company
Muncie, Indiana

***Crapo* Steel Conductors**

RECENT RATE CHANGES

DUQUESNE LIGHT CO, Pittsburgh, has been authorized by the state Public Utility Commission to put into effect a new tariff, increasing its fuel adjustment clause charges to large general service customers an estimated $777,658 annually. The increased schedule became effective on July 1. The commission said that the increase was permitted to become effective only after it had given consideration to rate base data and the company's revenue and expense experience submitted in accordance with PUC rules and regulations. Duquesne Light based its need for rate increases on the higher cost of coal. The increases, affecting 1,228 large industrial users, will fluctuate upward or downward in accordance with the price of coal under the fuel adjustment clause. The fuel clause charges under the new tariff apply to all large consumers using in excess of 10,000 kwhr per month on basis of a rate covering demands for more than five kva, but not more than 18,000 kva monthly. The clause now applies to use in excess of 100,000 kwhr per month by customers in that category. Duquesne Light under the tariff also revised the availability clause of its Rate "E"—school and Governmental Service—to include agencies of local, state and federal governments. This change will reduce charges for 25 such agencies by approximately $12,200 annually.

INDIANAPOLIS POWER & LIGHT CO has notified customers that those using electricity to heat water will have their monthly bill adjusted in line with coal costs. The change, approved by the Indiana Public Service Commission in April, became effective July 1, and will affect 7,300 of the utility's customers. The fuel adjustment charge will be made only when it amounts to 10 cents or more on the monthly bill. The coal clause provides that a monthly bill for water heating will increase 39/10,000th of one cent a kwhr for each 5-cent increase above $4.85 in the average cost of coal during the second preceded month, or decrease the same amount for each five-cent decrease in coal cost below $3.85 a ton. The regular electric rates for unlimited residential service are not affected by the coal clause.

ABBEVILLE, S. C., has informed its customers that the 10% discount has been discontinued on water and light bills. The city council estimates a $2,000 a month saving.

•

New GE Television Unit

A new television division has been set up in the General Electric Research Laboratory in Schenectady, Dr C. G. Suits, vice-president and director of research has announced. He explained that in view of the company's large activity in the television field, "it was considered appropriate that the Research Laboratory be in a position to make fundamental scientific contributions on which to base further technical progress." Clifford G. Fick, until recently division engineer of the receiver division of the electronics department, is head of the new division.

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ILSCO LUGS ARE 10% to 20% COOLER
than the heavy cast lugs you now use.

Prove it to yourself

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and the Ilsco 54-page illustrated catalog.

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ANTI-CORROSIVE PAINT
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LEAD & ALUMINUM PAINT
Simplify Maintenance
Give Maximum Protection
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HACKENSACK, N. J.

NEW ELECTRICAL CONSTRUCTION

A weekly selection of U. S. electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is indicated or implied

UTILITIES

Proposed Construction

Arkansas — Arkansas Power & Light Co., Pine Bluff, electric power plant in Eastern Arkansas. **$15,000,000.**

Ark., Hot Springs—Arkansas Power & Light Co., Pine Bluff, Lake Catherine Steam Generating Plant. **$9,000,000.**

Calif., Inyokern—Yards & Docks Annex, Navy Dpt., Arlington, Va., aerodynamics field laboratory, (aerodynamics range) ground range, external ballistics and electronics experimental installation, housing facilities for 230 families, at Naval Ordnance Test Station, **$3,670,500,** authorized.

Calif., Lockeford—Pacific Gas & Electric Co., 245 Market St., San Francisco, 60,000 h.p. substation, Over $100,000.

Calif., Point Loma (Sta. San Diego)—Yards & Docks Annex, Navy Dpt., Arlington, Va., laboratory supply and utility bldgs., incl. services and accessories at Naval Electronics Laboratory, Point Loma. **$1,590,000.** Authorized.

Calif., Stockton—State Div. of Architecture, P. Wks. Bldg., Sacramento, electrical distr. sys. for Stockton State Hospital. Anson Boyd, state archt.

Ga., Atlanta—Georgia School of Technology, 225 N. Ave. N.W., radio station, $500,000 to $750,000. Plans deposit $25. Bush-Brown, Bailey & Heffernan, 688 Cherry St., N.W., archts.

Mass., Boston—City Transit Dpt., 294 Washington St., 600 ft. rapid transit tunnel in East Boston Dist. $950,000. Plans deposit $25.

Minnesota—Lake Region Electric Cooperative Assoc., Pelican Rapids, rural distribution lines, generating facilities, Otter Tail Co., **$1,100,000.** REA.

Nebraska—Norris Rural Public Power Dist., Beatrice, 319.45 mi. rural distr. lines, Lancaster and Gage Counties, **$300,000.** Brown Eng. Co., K. P. Bldg., Des Moines, engrs.

New Mexico—Bureau Reclamation, Dpt. Interior, El Paso, Tex., constructing Socorro and Alamogordo Sub-station structures, Rio Grande Proj. Spec. R5-5 (Region 5). L. N. McClellan, Denver, ch. engr.

Oklahoma-Arkansas — Arkansas Valley Electric Cooperative, Inc., W. M. Milton, mgr., Ozark, Ark., 400 mi. rural distr. lines, Sequoyah and LaFore Counties, Okla. and Franklin, Crawford, Johnson, Logan and Scott Counties, Ark., **$360,000.** H. B. Goeb & Assoc., 1207 Texas Bank Bldg., Dallas, Tex., engrs.

Oregon-Washington—Bonneville Power Admin., 729 N. E. Oregon St., Portland, Ore., 26 mi. McNary-Pasco 115 kv. transmission line, Inv. 4292, Umatilla and Franklin Counties.

Oregon—Lane County Electric Co-operative, 436 Charnelton St., Eugene, 25 mi. single phase rural distr. line, Lane Co. T. C. Smith. c/o owner, engr.

Oregon—Bonneville Power Admin., 729 N. E. Oregon St., Portland, 22.8 mi. Albany-Salem 115 kv. transmission line, Inv. 4291, Marion Co.

Tenn., Shelbyville—Duck River Electric Membership Corp., 256.9 mi. rural distribution lines, Belford, Moore, Franklin, Lincoln, and Rutherford Counties, Plans deposit $25. Wm. M. Wilson, East Side Public Sq., engr.

Tex., Garland—City, D. Cecil Williams, mayor, addn. to electric power bldg. and lighting area, $75,000. H. B. Goeb & Assoc., 1207 Texas Bank Bldg., Dallas, engrs.

Washington—Bureau Reclamation, Dtp. Interior, Building 1-A, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping,, f.o.b. cars Odair, outdoor power transformers for Left Powerplant and Right Powerplant, Columbia Basin Proj. Spec. 2335.

Low Bidders & Contracts Awarded

Arizona—Bureau Reclamation, Dpt. Interior, Bldg. 1A, Denver Federal Center, Denver, Colo., three 30,000 kva transformers for Bank 2, Phoenix substation, Spec. 2300, Davis Dam Proj., to Allis-Chalmers Mfg. Co., Continental Oil Bldg., Denver, Colo., $445,000. Bids 6/24, awarded 6/29.

Calif., Davis—Bd. Regents, University of California, Berkeley, July 14, utility connections for Soils & Irrigation, and Secondary Bldg., Plant Science Bldg., utility dist. sys. No. 2 on Davis Campus, from Associated Electrical & Mechanical Co., 223 Clara St., San Francisco, **$379,973.**

Colorado — Bureau Reclamation, Dpt. Interior, Bldg. IA, Denver Federal Center, Denver, July 1, Loveland-Greeley, 115 kv. and Loveland substation, Loveland City 69 kv. transmission lines, Colorado-Big Thompson Proj., Larimer and Weld Counties, Spec. 2266, Sched. 1, from Elliott Constr. Co., 521 Sunderland Bldg., Omaha, Neb., **$262,730.**

Mich., Sault Ste. Marie—U. S. Eng. 609 Federal Bldg., Detroit, Zone 31, July 15, hydroelectric power plant, appurtenant works at St. Mary's Falls, St. Mary's River, Serial No. Eng.-20-064-48-100, Lot I, from Dunbar & Sullivan Dredging Co., 2312 Buhl Bldg., Detroit, **$916,175;** Lot II, from Tuller Constr. Co., 95 Monmouth St., Red Bank, N. J., **$3,564,704.**

Okla., Ponca City—Oklahoma Gas & Electric Co., 321 Harvey St., Oklahoma City, 20,000 kw. turbo generator for Beerbower power plant, near here. to General Electric Co., River Rd., Schenectady, N. Y., **$775,000.** Frank Partridge, 319 N. Harvey St., Oklahoma City, engr.

Washington—Columbia County Co-operative Assoc., Dayton, 248 mi. rural distr. lines, Columbia Co., to Puget Sound Electric Corp., 2135 5 Ave., Seattle, Zone 1, **$170,243.**

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D. C., Wash.—P. Bldgs. Admin., F. St. between 18 and 19 Sts. N.W., engineering bldg. **$1,788,000;** auditorium and fine arts bldg. **$2,953,425,** for Howard University.

O., Toledo—St. Vincent's Hospital, Sister Beatrice St. Louis, administrator, 2213 Cherry St., Center, West and Kitchen bldg. wing addns. to hospital. $3,500,000, Maguolo & Quick, 4908 Delmar Blvd., St. Louis, Mo., archts.

S. C., Greenwood — Greenwood Cotton Mills, rayon weaving plant, **$3,000,000.** McPherson Co., Greenville, archts.

Tex., Houston—Phillips Chemical Co. (Subsidiary of Phillips Petroleum Co.) Bartlesville, Okla., ammonium sulphate plant on Ship Channel. Aprrox. **$6,000,000.**

Utah, Kearns—Arthur & D. C. Caplan, Kearns, approx. 2,400 housing units. **$14,000,000.**

Wis., Milwaukee—City, Milwaukee Auditorium Bd., 500 W. Kilbourn Ave., Zone 33, 300 x 400 ft. con., brick, steel auditorium addn. $3,000,000. Eschweiler & Co., 720 E. Mason St., Zone 2, archts.

Low Bidders & Contracts Awarded

D. C., Wash.—Catholic University of America, Wash., classroom bldg., dormitory, chapel, to Joseph F. Nebel Co., 2142 P St., N.W., Zone 7, **$1,108,000.** Bids 6/21, awarded 7/13.

Ill., Chicago—Home for Aged Jews, 6140 S. Drexel St., 6 story, brick, rein.-con. home addn., masonry, carpentry work, to M. Handler & Co., 2720 W. Chicago Ave., Est. **$1,250,000.**

Ind., Tell City—Perry County Memorial Hospital, Tell City, July 15, 2 story, bsmnt., 50-bed brick, stone trim, rein.-con., structural steel County Memorial Hospital, from F. W. Owens Co., 119 N. 5 St., Louisville, Ky., **$1,280,000.** Est. $500,000.

Tenn., Knoxville—University of Tennessee, July 16, food processing bldg., from A. R. McMurry, Knoxville, **$538,087.**

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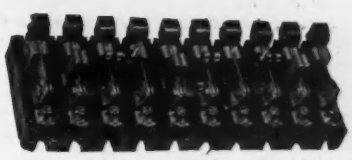

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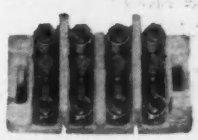

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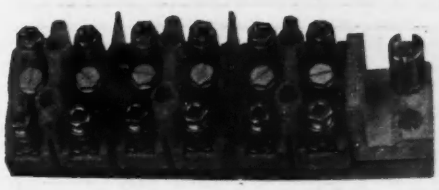

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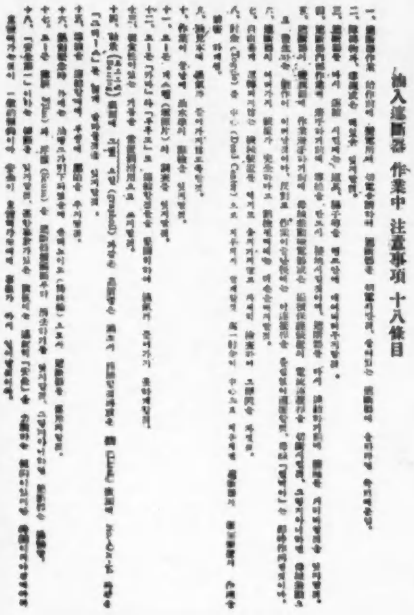
LETTERS TO THE EDITOR



18 DON'TS when working on oil circuit breakers. Translated from *Electrical World* March 27, 1948, p 110

To The Editor of ELECTRICAL WORLD:

It has occurred to me that the editors of ELECTRICAL WORLD might be interested in the practical use being made of the copy of this magazine.

A copy of safety rules for working on oil circuit breakers taken from one of the March issues has been translated into Korean and mimeographed and distributed to all electrical workmen employed by the Seoul Electric Company. As you may know, the Korean reads from the top down and from right to left.

The translation and distribution of this list is being handled by my Substation Engineer, Mr. Chung K. Lee, who is a naturalized American citizen, received his Electrical Engineering training in Kansas State College and the General Electrical Test Course. He has returned to his native land to assist in the rehabilitation of the power system in South Korea. He conducts weekly classes teaching the Korean personnel efficient operation and maintenance of all equipment in substation, stressing good safety practice.

Conditions as you know are very grave since the Russians pulled the switch on May 14th. A group of American engineers are now here studying the problem and I have been assisting them in their studies of the system of this company.

Raymond D. Sherman
Operations Engineer
Seoul Electric Co
Seoul, Korea

Relay Terminal Blocks

To the Editor of ELECTRICAL WORLD:

I read your magazine rather carefully most of the time and am interested in the "Technical Trends" as well as other parts of your magazine. In the April 3 issue, however, your third item under "Technical Trends", p 20, referring to terminal blocks for all differential relays, is interesting to me for I made my living several years in relaying and relay testing in the field.

In our Company, we use a 2-pole, single-throw, small knife switch for the trip circuit of *each relay*, with of course, the wiring terminating on the test switch. Similar switches are used for the current and potential circuits of the individual relays also.

The instructions are that the first thing that the test man does upon starting any relay testing is to open the trip switch on the individual relay or on all of the relays on the circuit to be tested. This is particularly true on differential relays as the wiring thereof is generally much more involved and widespread than on the other relays. Of course, sometimes the boys have not followed the rules and tripping has resulted, but this has been very rare and the man who makes such a mistake never forgets it or ever repeats it.

Relative to terminal blocks, we bring wiring to the terminal blocks on the board and from there spread it out to individual relays, instruments, control switches and Duquesne Light test switches. However, we do not have a terminal block as such for differential relays nor for each relay, but the dpst knife switch is in effect a terminal.

Duquesne Light Company also used this (the dpst knife switch in the tripping circuit of each protection relay, in 1923 to my certain knowledge, had been using it several years previously, and expect to continue using it.

Old stuff, Editor, old stuff!

The last item under this subject, "Design and Construction of Remote Rural Lines," is very interesting. We have little rural territory; that is, we call it rural but some of the others do not. We have built a reduced cost line in some cases, and then some years later (and not so many), we wished to high heaven we had built a bigger, stronger line and built 3-phase instead of single phase. Many others probably found themselves in the same situation. However, we must remember that spending extra money ahead of time has to be based upon somebody's faith in the business, and with the rising capital costs as well as the rising operating cost, this is a very fine decision for one to be forced to make.

B. M. Jones
Planning Engineer
Duquesne Light Co

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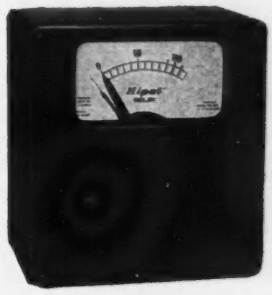

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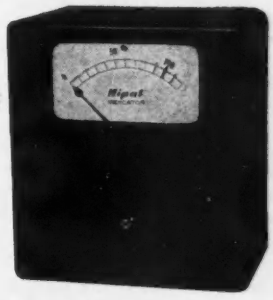

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BOOK REVIEWS

Combustion Engineering. **Edited by Otto de Lorenzi. Published by Combustion Engineering Co, Inc, New York 16. 1023 pages, illustrated. Price $8.**

This is really a handbook about fuels, boilers and the accessories involved in starting evaporated water through useful heat cycles. A corps of the publisher's engineers collaborated in providing the thirty-one chapters and three appendices which afford an authentic record of the evolved practices in applying furnaces for generation of steam. Individual chapters are devoted to fuel (data about coal field characteristics), stokers, pulverizers, burners, furnace proportions, fluid cycles, the ASME boiler code, forced circulation, superheaters, steam purification, feed heating, heat recovery, testing, etc. There is a well-detailed set of examples to show how to calculate performance. Appendices present comprehensive steam tables; properties of air, gas vapors; heat loss factors, etc. In addition the book affords numerous diagrams of boilers supplied by the publisher to various utility and industrial concerns.

Battlefronts of Industry. **By David O. Woodbury. Published by John Wiley & Sons Inc, 440 Fourth Ave, New York 16, N. Y. 342 pages. Price $3.50.**

The story of Westinghouse in World War II, including the personal parts played by many executives, scientists and engineers. A number of significant war developments are unfolded step-by-step from the original idea through the technical head aches, and on to quantity production. These include tank gun stabilizers, electric torpedoes, and aviation gas turbines and jet propulsion units. Others of the 24 chapters discuss the role of designing and manufacturing optical instruments, insecticide containers, radar, bomb fuses, mobile power houses, x-rays, and machinery for producing the atomic bomb. Typifying all American industry, by such achievements the author shows that under the system of free enterprise, when human beings are spurred by emergency, they display a genius that they did not dream they possessed.

Electronic Instruments. **By I. A. Greenwood, Jr, J. Vance Holdam, Jr, and Duncan Macrae, Jr. Published by McGraw-Hill Co, Inc, New York 18, N.Y. 721 pages, illustrated. Price $9.**

It should be understood that this MIT Radiation Laboratory Series volume is not devoted to electronic voltmeters and various forms of industrial instruments. On the contrary it deals with analog computers, the instruments of servomechanisms, regulators of current and voltage and test devices for pulse equipment. Implementation of arithmetical, calculus computers and integrators, function generators, curve matching precede the evolution of precision servomechanisms, component by component. Value to the non-military reader lies largely in the usefulness of these components by themselves for practical industrial computations or controls. Part V (the design and construction of electronic apparatus) is particularly helpful in the criteria that should guide the selection of elements to achieve particular objectives.

Radio Engineering. By F. E. Terman. Published by McGraw-Hill Book Co., New York. 969 pages, illustrated. Price $7.

Completely rewritten this third edition reflects the 10 years of change in the radio art. In particular there is greatly enlarged stress on microwaves and pulse techniques. The tube section adds electron optics, klystrons, magnetrons. As a consequence of this modernization the text is more fully devoted to principles so that they may be the basis for understanding the greatly ramified expansion of the electronic art. That makes the book an unusually appropriate one for the "60-cycle engineer" to rely upon for a facile transition to the phenomena of the higher frequencies.

Techniques in Exerimental Electronics. **By C. H. Bachman, Published by John Wiley & Sons, New York. 252 pages, illustrated. Price $3.50.**

Present day techniques in experimental electronics have been virtually unattainable except by personal contact with laboratory workers. For this reason this book contains a type of information that is particularly rare. In it the author has gathered valuable information on such topics as; methods of applying and using fluorescent materials, cathode coatings, tungsten characteristics and vacuum-glass-blowing techniques. The material covered is particularly concerned with controlled beams of charged particles in vacuum or at very low pressures, rather than the conduction of control and another on the manipulation of materials in the vacuum system. For the electronic laboratory technician and experimenter this book is a must.

Power from the Wind. **By Palmer C. Putnam. Published by D. Van Nostrand Co, Inc, New York. 224 pages, illustrated. Price $6.**

The Granpa's Knob experiment was a noteworthy effort to assay the practicability of using the power of wind on a large scale. This is the record of the 1250-kw venture. Technical success was, unfortunately, not accompanied by complete substantiation of economic practicality. The sponsors and explorers should be commended for making available such a candid and detailed recital of the development and its trial runs. On these facts can be built further prosecution of the program to establish the feasibility of deriving 2½-mil energy from a capital outlay substantially less than incurred in most hydro developments. The technical evidence is here to confirm the through study which preceeded the Vermont installation and analyzed its subsequent behavior. It seems that mention could have been made of Percy Thomas' larger designs as projected concurrently in Electrical World (April 28 and May 12, 1945).

Microwave Transmission Design Data. **By Theodore Moreno. Published by McGraw-Hill Book Co, New York. 248 pages, illustrated. Price $4.**

Four portions deal respectively with (1) transmission line theory extended into microwaves, (2) coaxial lines and flexible cables, (3) waveguides and (4) dielectrics. "Design data" is appropriate component of the title because the aim is to coach the engineer how to meet practicalities in applying theory. For that reason there is much quantitative information customarily omitted from theoretical treatments. Constants and loss are given for over 300 dielectrics at 3 x 10^9 and 10^{10} cps.

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ELEC. ENGR., BEE, registered, age 33, desires industrial plant equipment application or production engineering position. PW-5774, Electrical World.

SYSTEM OPERATOR with 20 years electric utility operating experience, desires permanent position South or South West. Best of references. PW-5859, Electrical World.

Additional Employment Advertising on Page 156